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Příspěvek k luminescenci diamantů
A Contribution to the Luminescence of Diamonds

Úkolem této práce není řešit otázku původu luminescence diamantů. Autoři v ní chtějí pouze upozornit na určité vztahy, které zjistili mezi krystalovým tvarem diamantů, jejich barvou a barvou luminescence v ultrafialovém světle a stanovit procentuální zastoupení jednotlivých barev luminescence na co největším počtu vzorků. K tomuto účelu proměřili proto jednak všechny diamanty ze sbírek mineralogického oddělení Národního musea v Praze, jednak diamanty, které během delší doby prošly Státním ústavem pro drahé kovy v Praze. U diamantů z druhé skupiny nebylo ovšem možno určit ani naleziště, ani původní krystalové omezení. Proto má tato část práce význam především pro určení procentuálního zastoupení různých barev při luminescenci diamantů.

Diamanty ze sbírek Národního musea

Ve sbírkách mineralogického oddělení Národního musea měli autoři k disposici celkem 179 lokalisovaných diamantů. Z tohoto počtu jsou jednotlivé oblasti výskytu zastoupeny takto:

Čechy	1 kus,
Jihoafrická Unie	50 kusů,
Lüderitzova zátoka	2 kusy,
Belgické Kongo	2 kusy,
Aljaška	1 kus,
Brazílie	107 kusů,
Austrálie	16 kusů.

V anglickém textu je uveden podrobný morfologický popis všech těchto diamantů i jejich luminescence.

Shrnutí výsledků pozorování na diamantech ze sbírek mineralogického oddělení Národního musea. Ze závěrečné tabulky č. 7 v anglickém textu jsou zřejmé některé závislosti mezi morfologií krystalů a barvou luminescence, jež ovšem po studiu většího množství materiálu z jednotlivých lokalit bude možno doplnit, příp. opravit.

1. Bezbarvé, bílé a namodralé diamanty oktaedrického až rhombododekaedrického habitu ze všech lokalit lumineskují modře nebo jsou inaktivní. Poměrně vzácné anomalie v luminescenci diamantů tohoto typu jsou způsobeny zonárností (2 případy), v ostatních případech jde o luminescenci povrchových nečistot, nikoliv tedy o skutečné anomálie v luminescenci. Zjištění modré luminescence jako charakteristické pro diamanty tohoto typu jsou vcelku ve shodě s pozorováním sovětských autorů na diamantech ze sibiřských lokalit.

2. Barevné diamanty oktaedrického až rhombododekaedrického habitu lumineskují většinou barevně, vzácněji jsou inaktivní (diamanty hnědočervené až žlutohnědé) a jen v jediném případě (z Lüderitzovy zátoky) byla zjištěna luminescence modrá. Porovnáme-li barvu diamantů tohoto typu s barvou luminescence, dostaneme tyto výsledky:

a) zlatožluté diamanty (Lüderitzova zátoka) lumineskují žlutozeleně nebo modře,
b) citronově žlutý diamant (Čechy) lumineskuje žlutooranžově,
c) medově žlutavé diamanty (Austrálie) lumineskují oranžově,
d) žluté diamanty z Belgického Konga lumineskují růžově, z Brazílie žlutozeleně, žlutě, růžově nebo zůstávají inaktivní, diamanty z Austrálie lumineskují modrozeleně,
e) žlutohnědé až hnědočervené diamanty (Brazílie) jsou inaktivní,
f) zelené až žlutozelené diamanty (Brazílie) lumineskují modrozeleně až žlutozeleně,
g) růžové diamanty (Brazílie) lumineskují růžově.

3. Diamanty krychlového habitu lumineskují pravděpodobně barevně. Zjištěná žlutá luminescence zelenožlutého diamantu z dolu Wesselton Mine a oranžová luminescence medově žlutého diamantu z Brazílie. Vzhledem k malému množství materiálu (2 kusy) nelze zde dělat definitivní závěry.

4. Bezbarvé dvojčatné srostlice diamantových krystalů podle spinelového zákona lumineskují modře, chovají se tedy obdobně jako větší část bezbarvých jednoduchých krystalů.

5. Barevné dvojčatné srostlice diamantových krystalů podle spinelového zákona lumineskují pravděpodobně barevně. Na medově žlutých krystalech tohoto typu z Brazílie zjištěna oranžová luminescence. Vzhledem k tomu, že autoři měli k disposici krystaly tohoto typu pouze z jediného naleziště, nelze zde dělat definitivní závěry.

6. Cyklické srostlice diamantových krystalů podle spinelového zákona lumineskují pravděpodobně barevně. Na medově žlutých krystalech tohoto typu z dolu Wesselton Mine zjištěna oranžová luminescence. Vzhledem k tomu však, že autoři měli k disposici krystaly tohoto typu prakticky pouze z jediného naleziště, nelze ani zde dělat definitivní závěry.

7. Skupiny diamantových krystalů srostlých bez zřetelné zákonitosti, zůstávají v ultrafialovém světle pravděpodobně inaktivní.

8. Neprůhledné diamanty (např. bort, carbonado) jsou vždy inaktivní.

9. Nerovnoměrný vývoj diamantových krystalů, ať již jde o nerovnoměrné krystaly tabulkovité nebo o krystaly extremně protažené ve směru jedné z os, nemá vlivu na luminescenci diamantů. Tyto krystaly lumineskují zcela shodně jako obdobné krystaly vyvinuté rovnoměrně.

10. Chaumetův názor, že intensita luminescence je úměrná čistotě diamantových krystalů, nemá všeobecnou platnost. Zdá se, že platí pouze pro některé naleziště (např. důl Wesselton Mine) nebo pro některé typy diamantových krystalů z různých lokalit.

Broušené diamanty ze Státního ústavu pro drahé kovy

Je poměrně málo prací, uvádějících barvu luminescence v závislosti na počtu měřených kamenů. Kromě toho data o barvě luminescence jsou značně neúplná a většina autorů se spokojuje zjištěním, zde kámen luminiskuje, či je inaktivní.

Ke zjištění pravděpodobného rozložení barev při luminescenci nebyly autory této práce vzaty za základ lokalisované diamanty ze sbírek Národního musea, protože jejich počet 178 kusů se nezdál být dostatečný. Proto byly proměřovány diamanty, které prošly během delší doby Státním ústavem pro drahé kovy v Praze.

Celkem zde bylo proměřeno 6 461 diamantů brilantového brusu, 1 581 diamantů routového brusu a 729 průmyslových diamantů. U průmyslových diamantů a u rout, které byly často menších rozměrů, bylo někdy obtížné určit pouhým okem barvu luminescence. Proto ve sporných případech byla měření provedena pod mikroskopem. Protože tyto drobné kameny byly ve velké většině zasazeny do šperků a průmyslových předmětů, nebyla pro routy a průmyslové diamanty rozlišována intensita modré luminescence.

Z 6461 kusů briliantů bylo 58,78 % inaktivních, 19,53 % svítilo modře nebo silně modře, 16,79 % slabě modře, 1,15 % modrozeleně, 1,15 % žlutozeleně, 0,34 % žlutě, 1,63 % oranžově, 0,53 % růžově, 0,05 % červeně a 0,05 % bíle.

Z 1581 rout svítilo modře 13,79 %, modrozeleně 2,02 %, žlutozeleně 1,33 %, žlutě 1,77 %, oranžově 2,86 %, růžově 0,51 % a 77,72 % rout bylo inaktivních.

Ze 729 průmyslových diamantů svítilo 13,85 % modře, 0,27 % modrozeleně, 0,14 % žlutozeleně, 0,14 % žlutě, 0,27 % oranžově, 0,14 % růžově a 85,19 % bylo inaktivních.

Z pozorovaných barev nebyla dosud v literatuře popsána bílá a červená barva luminescence, růžovou pak popisují pouze sovětští autoři (19).

Autoři této práce považují za milou povinnost poděkovat kolektivu pracovníků oddělení cenností Státního ústavu pro drahé kovy, zejména s. inž. L u d v í k u Z a k l o v i a s. L u d m i l e H a n z l o v é za nevšední ochotu, se kterou jim pomáhali při proměřování broušených diamantů. Dále děkují s. inž. I v ě R o u š a r o v é za pomoc při stanovení spektrálního charakteru ultrafialového světla obou používaných lamp.

A Contribution to the Luminescence of Diamonds

Introduction

On the luminescence of diamonds in UV light. Luminescence of diamonds induced by friction or heating has been described as early as 1663 by R. Boyle. Later on, other methods of induction of luminescence have been discovered, such as the application of cathode rays, X-rays and of UV light.

A number of opinions have been expressed concerning the origin of luminescence. P. Pringsheim (1,2) maintains that an admixture of foreign elemetns may bring about luminescence; thus diamonds without chemical admixtures should not luminesce. The same view is defended in the work of F. G. Chesly (3) who studied the luminescence of diamonds from various localities and the admixture of various elements by spectral analysis.

R. Robertson, J. J. Fox and A. E. Martin (4) showed that diamonds might be divided into two types between which there are differences in various physical properties. This theory is further developed and completed by the work of C. V. Raman (5, 6) and of other Indian authors (7—10), of which the work of G. R. Rendal (9) is devoted above all to the problem of the apparatus to be used for measuring the transmittency for UV light. Raman explains the differences in physical properties on the basis of deformations of the crystal lattice.

B. M. Bishui (11) expressed the view that the changes in physical properties are caused by crystal deformations caused by trace admixtures of foreign elements. R. J. Collins and H. Y. Fan (12) admit this possibility, as well. Approximately at the same time (1954) G. B. M. Sutherland, D. E. Blackwell and W. C. Simoral (13) published the results of their measurements. They found that diamonds which luminesce contain much more frequent admixtures of foreign elements than inactive ones.

An important paper was published by G. O. Gomon (14) who maintained that Raman's classification of diamonds did not correspond to his measurements. In conclusion he considers the explanation of Bishui (11) as more likely.

In 1958 E. N. Bunting and A. van Valkenburg (15) published a study containing the results of investigation of 1100 diamonds mostly of smaller size (individual diamonds weighed between 25 and 50 mg.). They carried out a number of optical, electrical and other physical mesaurements. They also anlyzed several diamonds of both types (according to Robertson, Fox and Martin) and they found that the presence or absence of any of the elements studied by them is not characteristic of either of the diamond types, as shown in Table 1, taken over from the authors' publications and summarizing the results of spectral analyses.

Table 1

Element	Type I No. 1	Type I No. 2	Type I No. 3	Type II No. 4	Type II No. 5	Type II No. 6
Al	T	— ?	T	FT	— ?	— ?
B	T	— ?	T	—	VW	—
Ca	W	—	W	VW	T	—
Cu	VW	FT	T	VW	FT	FT
Fe	T	— ?	T	VW	T	FT
Mg	T	FT	T	VW	T	FT
Na	W	—	W	W	—	—
Si	VW	FT	T	VW	T	FT

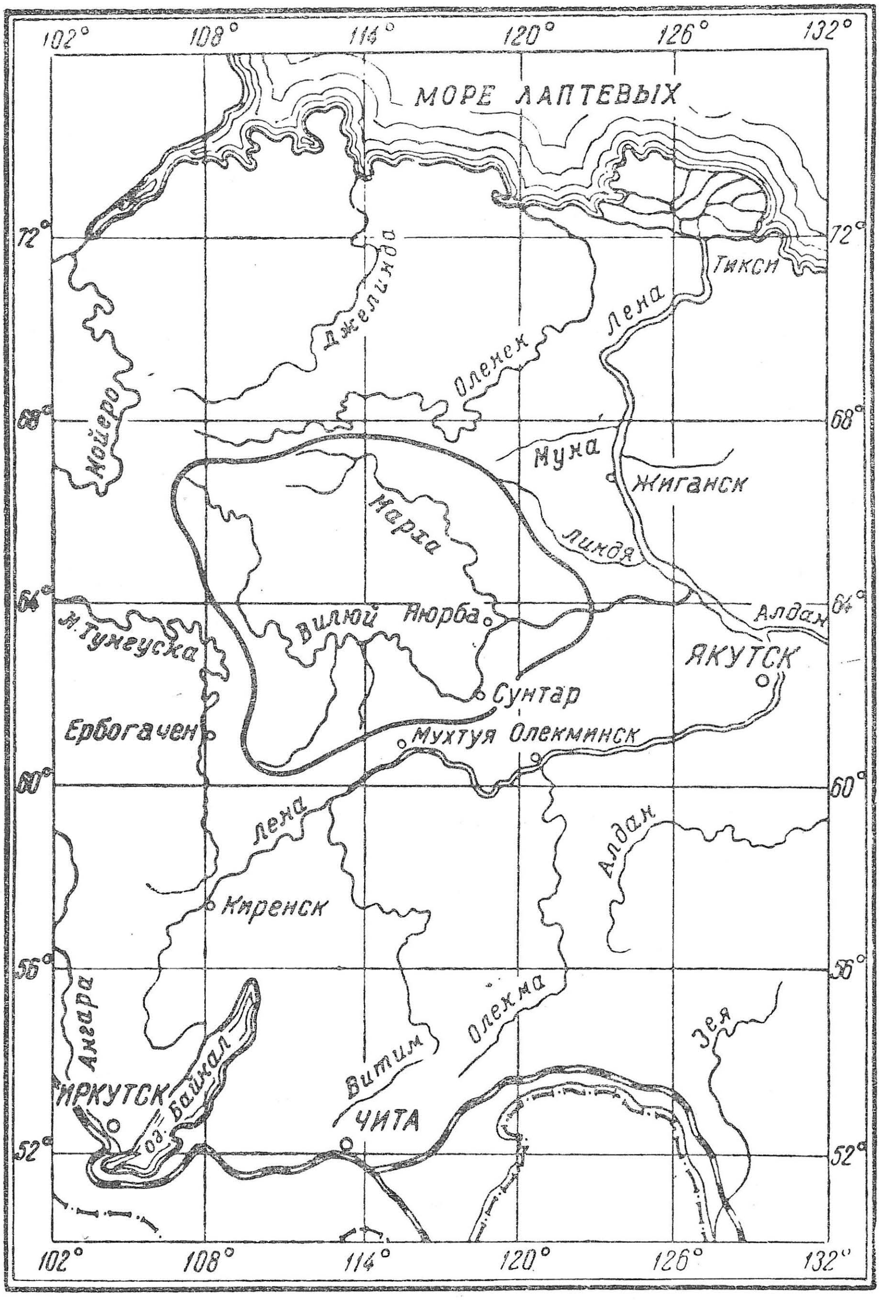
In general the symbols indicate the following concentration ranges as parts per million of metal in the diamonds:

W — 100 to 1000 ppm
VW — 10 to 100 ppm
T — 1 to 10 ppm
FT — less than 1 ppm
— — not detected

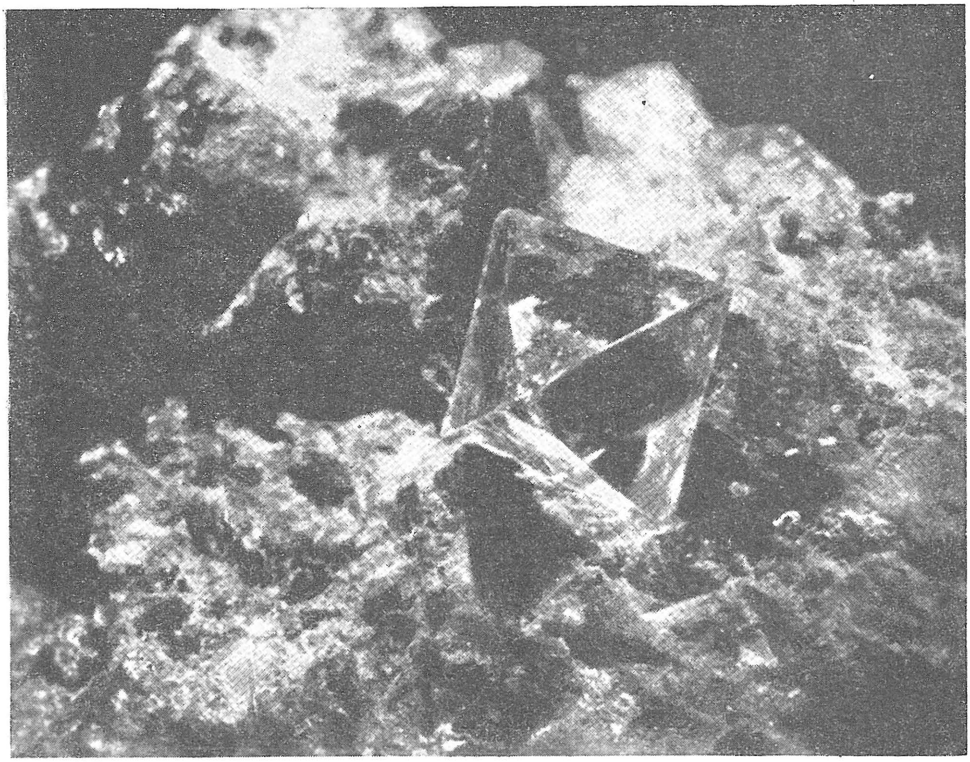
The colour of diamonds in UV light. Most diamonds display colour luminescence upon irradiation with UV light. The values of percent distribution of the individual colours and of the number of inactive diamonds differ very widely. It is most probably caused by the fact that most authors did not emphasize the colour of luminescence but rather the fundamental question whether the stone luminesces in UV light and further the problem of origin of the individual diamonds tested, as well as by the fact that most authors studied only a relatively small number of diamonds.

Raman (5) measured several sets of diamonds. Of 88 South African diamonds from a heraldic jewel, illuminated with UV light of wavelengths between 3500 and 3900 Å, 79 shone with a blue light od different intensities, 5 shone with other colours than blue (blue-green, yellow-green and yellow) and 4 were inactive. Of 52 diamonds from the Indian state Panna, studied under identical conditions, 3 shone intesely blue, 12 markedly blue, 21 weakly blue, 14 very weakly blue and the intensity of luminescence of the other 2 was not measurable. Of 29 other diamonds from Panna 10 were of jewel quality, all of which shone with a blue colour, and 19 were industrial, some of which shone with a blue, others with a yellow-green or yellow colour. A part of them shone with blue and yellow colours in a mixture. B. W. Andersen (16) maintains that out of 100 diamonds 10—20 will luminesce blue, 20 weakly blue and about 2 yellow.

A collective of Soviet authors (19) published data on diamonds from the large Siberian localities in the vicinity of the Vilyuy river. These diamonds have a blue and yellow luminescence or possess only a weak, not precisely definable luminescence or do not luminesce at all. Only very rarely a red, green or zonar luminescence could be observed. The percent participation of the individual luminescence types, as cited by the authors, differs considerably over the extensive locality. The paper on the luminescence of Siberian diamonds is especially interesting on account of the fact that the authors point out several rela-



Map. 1. The Sibirian localities of diamonds (according to 19).



Diamond crystal from the diamond fields of Vilyuy River (according to 19).

tionships they found to exist between the crystal shape and the colour of luminescence. The colour of luminescence of diamonds is also taken up in the papers of K. Sunanda Bai (7) and of L. F. Cole and R. Webster (21).

Results

It is not the objective of this paper to solve the problem of origin of diamond luminescence. The authors only wish to call the attention to some relationships they found between the crystal shape of diamonds, their colour and the UV luminescence, and to determine the percentage of the individual colours of luminescence on a maximum number of samples. For this purpose they used all the diamonds found in the collection of the Mineralogical Department of the National Museum in Prague as well as diamonds registered by the State Institute for Precious Metals in Prague. With the latter the locality and the original crystal form could not be determined. Therefore the corresponding section of the paper has only a limited significance, above all for the determination of percentage of the individual colours in diamond luminescence.

For the determination of diamond luminescence the authors used a mercury discharge tube Elmed Lumina U with a dark-blue filter and for the sake of comparison also a UV lamp with Wood's filter. On the basis of spectral analysis of the light from the two sources, carried out on an ISP spectrograph in the laboratories of the State Institute for Precious Metals it was found that the maximum intensity of light lay between 3690 and 3700 Å. (Pl. XXXI. fig. 1). However, the two light sources differ considerably in the range of the weaker intensity wavelengths. The first lamp transmits weaker intensities all over the range between 3340 and 3950 Å and some rays in the vicinity of 4050 Å, the second lamp transmits a practically continuous radiation in the region of 3120—3900 Å and some rays in the region of 3030 Å and 4050 Å (Pl. (Pl. XXXI. fig. 2).

The colour and intensity of diamond luminescence in applying the two lamps did not practically differ. In this property, namely that the luminescence in UV light of different wavelengths is proctically identical, diamonds differ from a number of other minerals which luminesce with completely distinct colours at different UV wavelengths.

Diamonds from the collection of the National Museum. In the collections of the Mineralogical Department of the National Museum there were altogether 179 localized diamonds available. In this number the individual localities are represented as follows:

Bohemia	1 specimen
Union of South Africa	50 specimens
Lüderitz Bay	2 specimens
Belgian Kongo	2 specimens
Alaska	1 specimen
Brazil	107 specimens
Australia	16 specimens

In the following review each specimen is described and its inventory number, size and colour of luminescence presented. With simple crystals also the symbol of crystal type according to A. Fersman and A. Goldschmidt (21) can be found. The following symbols (taken over from the above authors) are used:

A 1 — combination of 111 and 110 with 111 predominant
A 2 — combination of 111 and 110 with 110 predominant
A 1—2 — combination of 111 and 110 with equal participation of 111 and 110
B 1 — combination of 111 and 110 with the 100 face
B 4 — combination of 111 and 110 with sunk areas in place of the 100 faces
D 1 — crystals with the 100 face predominant

During the morphological study only the habit of the individual crystals was noted. Therefore those faces which do not determine the crystal habit even if they are represented are not mentioned here (e. g. 112, 223, 133 etc.).

Dlažkovice (SW of Třebenice in the Bohemian Mittelgebirge)

The exact locality is not known as it was found during the grinding of the material remaining after separation of Bohemian garnet from the pits between Chrášťany and Podsedice. (Cf. Map. 2, p. 194).

No. 1. Rich lemon yellow, very imperfectly developed 111 with imperfectly marked faces 100 and 110. A detailed description is to be found in the papers by B. Ježek (23, 24).
Inv. no. 6712 size 4.13 × 2.63 mm., weight 0.0573 g.
FG — B 1
Luminescence: yellow-orange
N.B. The first Bohemian diamond (Pl. XXXIX. row 1.)

The yellow-orange luminescence observed in the diamond from Dlažkovice in quite extraordinary. So far it has never been found in any diamond under UV light and there is no such report in the existing literature. In determining the luminescence the individual subjective point of view is to be considered to a certain degree. However, the authors of this paper have not found any similar luminescence in any case of the 179 investigated ones in the National Museum collections or in any of the 8771 investigated cut or idustrial diamonds. On account of the extraordinary luminescence of the diamond from Dlažkovice and because of the fact that this is the first diamond ever found in Bohemia one of the authors devoted a special paper to this stone (25).

Wesselton Mine (formerly Premier Mine near Kimberley, Union of South Africa)

No. 2. Colourless, only slightly yellowish 111, with no corrosion marks.
Inv. no. 6808 size 4 mm.
FG — A 1
Luminescence: blue

No. 3. Colourless, only slightly yellowish 111, with little developed, coarsely striated 110 faces. Only slightly transparent.
Inv. no. 6811 size 4.5 mm.
FG — A 1
Luminescence: blue

No. 4. Colourless, only slightly yellowish to brownish 111, with black admixtures. The 111 faces are only minutely replaced by 110 ones.
Inv. no. 6814 size 7 mm.
Luminescence: marked blue

No. 5. Colourless, only slightly brownish 111, with a yellow tinge. The 111 faces are partly replaced by corrosion coarsely striated 110 ones.
Inv. no. 6809 size 3 mm.
FG — A 1
Luminescence: blue

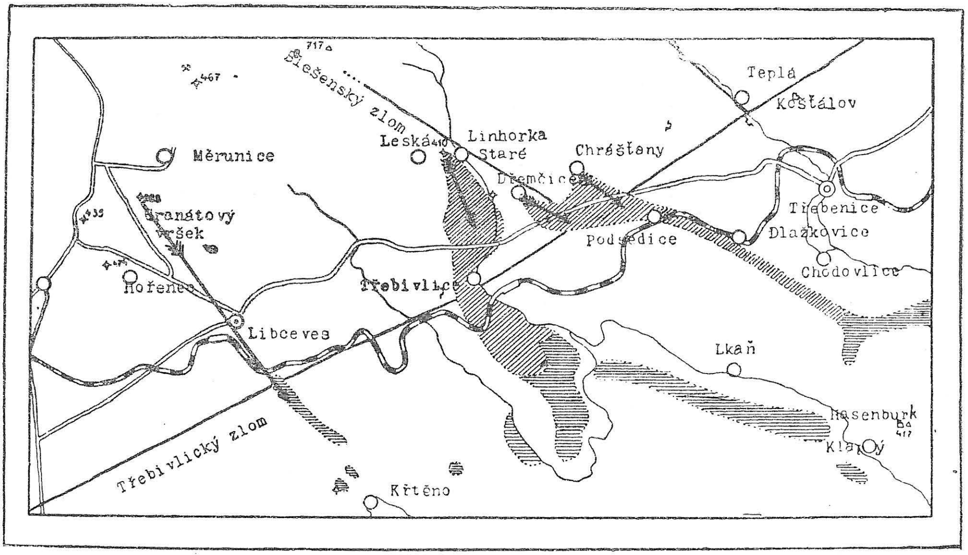
No. 6. White to bluish, slightly transparent 111, very heavily corroded.
Inv. no. 6812 size 8 mm.
FG — A 1
Luminescence: blue

No. 7. Perfectly coulourless 111, with a bluish luster. Edges are slightly spherically rounded.
Inv. no. 6805 size 8 mm.
FG — A 1
Luminescence: marked blue

No. 8. Colourless, only slightly brownish 111, with minute 110 faces, almost opaque.
Inv. no. 6807 size 7.5 mm.
FG — A 1
Luminescence: in translucent parts blue, elsewhere inactive

No. 9. Colourles, only slightly greenish, opaque 111, with minute 110 faces, markedly rounded. The 111 faces are heavily corroded.
Inv. no. 6801 size 8.5 mm.
FG — A 1
Luminescence: not detectable on account of opaqueness

No. 10. Colourless, only slightly brownish 111, surface corroded, with impurities and opaque.
Inv. no. 6806 size 4 mm.
FG — A 1
Luminescence: on the surface green-brown, otherwise inactive



Map. 2. The locality of diamond in the Bohemian Mittelgebirge (according to J. Hibsch).

No. 11. Colourless only slightly brownish 111. Due to heavy corrosion the 110 face predominates at places; it is finely lamellar. The crystal is irregularly elongated.
Inv. no. 6802 size 6.5 mm.
FG — A 1—2
Luminescence: marked blue

No. 12. Colourless, only slightly brown-yellow 111. The 111 faces are at places markedly replaced by the 110 ones; they are coarsely striated.
Inv. no. 6813 size 6 mm.
FG — A 1—2
Luminescence: blue

No. 13. Colourless, only very slightly brownish 111. At places the coarsely lamellar face 110 predominates due to corrosion.
Inv. no. 6903 size 6 mm.
FG — A 1—2
Luminescence: the inner part of the crystal blue, the surface yellow-green.

No. 14. Colourless only slightly brownish crystal with black parts. Combination of 111 and 110. On account of a nonuniform crystal development the coarsely lamellar 110 faces predominate at places.

Inv. no. 6800 size 6.5
FG — A 1—2
Luminescence: in most of the crystal blue, crystal nuclei orange (zonar).

No. 15. Colourless crystal with bluish luster and black parts. Combination of 110 and 111. The 110 faces are smooth, very considerably spherically rounded. A non-uniformly developed crystal with marked faces only on one side.
Inv. no. 6799 size 6 mm.
FG — A 2
Luminescence: marked blue

No. 16. Colourless, only slightly yellowish, perfectly transparent 110 without any corrosion marks.
Inv. no. 6810 size 4.5 mm.
FG — A 2
Luminescence: marked blue

No. 17. Colourless, with black impurities, 110, only with minute 111 faces. Faces coarsely lamellar by concretion lamellae along 111 plane.
Inv. no. 6798 size 7 mm.
FG — A 2
Luminescence: blue light shining through.

No. 18. White, only slightly brownish, fairly impure 111, with a minute 100 face, devoid of any etching marks.
Inv. no. 6817 size 3 mm.
FG — A 1
Luminescence: weak blue
N.B. Combination of 111 and 100 without 110 is very rare.
Fersman and Goldschmidt did not find any.

No. 19. Yellow-green very imperfectly bounded 100, heavily rounded.
Inv. no. 6804 size 6 mm.
FG — D 1
Luminescence: intense yellow

No. 20. Honey-coloured, imperfectly bounded cyclic twin according to the spinel law.
Inv. no 6809 size 4 mm.
Luminescence: orange

No. 21. Rich honey-coloured rounded fragment of an imperfectly bounded cyclic twin according to the spinel law.
Inv. no. 6816 size 5 mm.
Luminescence: intense orange

No. 22. Rich honey-coloured rounded fragment of an imperfectly bounded cyclic twin according to the spinel law.
Inv. no. 6816 size 3.5 mm.
Luminescence: intense orange

No. 23. Rich honey-coloured, imperfectly bounded and rounded cyclic twin according to the spinel law.
Inv. no. 6816 size 3.5 mm.
Luminescence: intense orange

No. 24. Cluster of several violet translucent crystals, bounded by 111 faces. Crystal edges are partly spherically rounded.
Inv. no. 6815 size 4.5 mm.
Luminescence: inactive

No. 25. Fragment of a cluster of several violet translucent crystals with predominant 111 faces.
Inv. no. 6815 size 4 mm.
Luminescence: inactive

Summary of the results of the study of luminescence of diamonds from the Wesselton Mine (Nos. 2—25). The studied diamonds from the Wesselton Mine can be divided according to their luminescence and crystal form into the following four types:

1) Crystals of octahedric ranging to rhombododecahedric habit;

2) an imperfectly bounded crystal of cubic habit;

3) imperfectly bounded cyclic twins according to the spinel law;

4) imperfectly bounded aggregates of more octahedric crystals without any apparent regular concretion.

Type 1. is the most common type of diamond crystals in general and at the same time represents the most frequently occurring form in the Wesselton Mine locality, just as in all South African localities. Crystals with predominant octahedric faces (111) are especially characteristic of South African localities (type A — 1 according to Fersman and Goldschmidt) whereas crystals with predominant faces of rhombic dodecahedron (110) are less frequent (type A — 2). Striated 110 faces originate here according to the two cited authors through corrosion of the original octahedron (111). The participation of the two groups among the diamonds tested here is in full agreement with these data. Of a total of 16 specimens (nos. 2—17) 9 crystals have an octahedric habit (nos. 2—10), with 4 crystals (nos. 11—14) the octahedron and the rhombic dodecahedron are approximately in equilibrium and only with 3 crystals (nos. 15—17) the dodecahedron predominates. In view of its luminescence the first group may also comprise specimen no. 18 which, according to Fersman and Goldschmidt resembles most their type B 1, i. e. a transition between the octahedron and the rhombic dodecahedron with points cut off by a cubic face (100).

On the basis of the experiments it can be said that all the diamonds of this type (nos. 12—18) show a blue luminescence as long as they are not completely opaque (nos. 9, 10 and partly 8, 17 and 18). A similar conclusion, namely that octahedric to rhombododecahedric diamonds have a blue luminescence, was also reached by Soviet authors (19) who studied the diamonds of this habit originating from the Siberian locality in the vicinity of the Vilyuy river. It can be generally said that in the diamonds with a blue luminescence from the Wesselton Mine the luminescence intensity decreases with decreasing translucency, no matter whether the latter is caused by inhomogeneous inclosures (nos. 10, 17, 18) or by a network of microscopic cracks penetrating the entire crystal (nos. 8, 9). The most intense luminescence, on the other hand, is displayed by perfectly clear stones with a high, especially bluish luster, by the so-called tiffanyites (nos. 7, 15). The diamonds with blue luminescence from the Wesselton Mine thus comply with the view expressend by Chaumet (18, 22) that the jewel quality of a diamond is directly proportional to the intensity of their luminescence which was employed by Chaumet in selecting the raw material for jewellery. Diamonds no. 10, 13, 14 belonging to the first type display anomalous behaviour. The green-brown luminescence of diamond no. 10 and the yellow-green luminescence of no. 13 is not a true diamond luminescence but rather a fluorescence of impurities found on the crystal surface adhering to the deep corrosion pits. Diamond no. 10 does not display a true luminescence on account of its opacity, no. 13 has a blue luminescence. The only true anomaly is displayed by specimen no. 14 which has a zonar luminescence. The explanation of this zonality is not easy; not even a microscope would reveal any difference between the center and the surface of the crystal. It can be assumed, however, that the crystal core is bounded in a different way than octahedrically. Similar cases of zonality with a morphologically different bounding of the core are known with a number of minerals. Thus it can be taken for probable that the zonality in luminescence is here associated with morphological zoning. From analogy with type no. 3 the core of this crystal should be formed by a cyclic twin according to the spinel law.

Diamonds of the octahedric and rhombododecahedric habit from the Wesselton Mine are all colourless, white and bluish. The observed blue luminescence of these diamonds is in full agreement with the observations published in the treatise of Bauer-Schlossmacher (22). The weak yellowish, yellow-brown, brownish and greenish colour of some of them is of a purely mechanical nature; it does not cause any deformation of the crystal lattice and has thus no influence on the colour of luminescence.

Type 2. from the Wesselton Mine represented in the National Museum collections by a single specimen (no. 19) is according to Fersman and Goldschmidt rare on all the localities in the Kimberley region. In the above-cited book of Bauer-Schlossmacher green-yellow diamonds are reported to luminesce with a yellow-green or green-yellow colour. The yellow luminescence observed here is thus of a somewhat different hue.

The difference in luminescence in connection with the crystal form is quite apparent here as compared with type 1. Similarly clear is also the difference in colour which is fundamentally different than e. g. with specimens no. 2, 3, 9 and 16. While in these diamonds the yellowish or greenish colour is obviously caused by a foreign pigment the yellow-green colour of the cubic-habit diamond from the Wesselton Mine appears to be the true colour of the diamond of this type.

Type 3. (no. 20—23). The finding of an orange luminescence in diamonds of this type is also in disagrement with the data of the Bauer-Schlossmacher publication according to which the honey-coloured diamonds should display yellow or green-yellow luminescence. The orange luminescence cannot be found in the above book at all.

The difference in luminescence in connection with the crystal form as compared with the preceding types is here quite apparent, as well. Similarly the difference in colour exists here. The honey colour can be considered, just as the yellow-green colour of the type 2., as the true colour of cyclic twins according to the spinel law from the Wesselton Mine, which is caused by their crystal structure. The brownish hue of speciemen no. 20 is apparently caused by mechanical admixtures, similarly as in some diamonds of type 1. (e. g. no. 5, 8, 10, 11, 13, 14, and 18). This impurity decreases in all these cases the intensity of luminescence in agreement with Chaumet's observations.

Typ 4. is represente in the National Museum collections only by two specimens (no. 24 and 25). The difference in luminescence in connection with the crystal form and colour, as compared with the preceding types is here again quite apparent. The violet colour, which is quite rare in diamonds can be taken for the true colour of diamond aggregates of this type. It is of interest that although we are not dealing here with opaque diamonds they remain inactive under UV light. Hence it follows that the above-mentioned principle of Chaumet has not a universal validity but that in the Wesselton Mine locality it holds at most for simple crystals and regular crystal concretions.

Even if we are aware that the total number of 24 diamonds from the Wesselton Mine is not at all sufficient for definite conclusions to be made it may be assumed on the basis of the above observations that:

1) diamonds of octahedric and rhombododecahedric habit, colourless. white to bluish have a blue luminescence,

2) yellow-green diamonds of cubic habit have a yellow luminescence,

3) honey-coloured spinel-law twins have an orange luminescence,

4) violet aggregates of octahedric crystals without any apparent concretion regularity are inactive in UV light.

The percentage of the individual types as compared with their luminescence is as follows:

Table 2

	Luminescence					
	blue	yellow	orange	anomalous	inactive	
1. type	54 %			13 %	4 %	71 %
2. type		4 %			8 %	4 %
3. type			17 %			17 %
4. type						8 %
	54 %	4 %	17 %	13 %	12 %	100 %

Kimberley (without detailed localization; the above Wesselton Mine belongs to the Kimberley locality, as well)

No. 26. Colourless, only slightly brownish fragment 111, with very imperfect crystal bounding.
Inv. no. 394 size 3.5 mm.
FG — A 1
Luminescence: intense blue

No. 27. Markedly bright transparent fragment 111, with very imperfect crystal bounding.
Inv. no. 394 size 2 mm.
FG — A 1
Luminescence: blue

No. 28. Colourless, only slightly greenish, almost opaque 111, heavily corroded, with rounded 110 faces.
Inv. no. 5 size 22 mm.
FG — A 1
Luminescence: blue
N.B. A unique, extraordinarily large crystal (Pl. XXXIV. row 1)

No. 29. Colourless, only slightly brownish fragment 111, with very imperfect crystal bounding.
Inv. no. 394 size 3 mm.
FG — A 1
Luminescence: blue

No. 30. Colourless, only slightly brownish fragment 111, with very imperfect crystal bounding.
Inv. no. 394 size 2.5 mm.
FG — A 1
Luminescence: very dull

No. 31. Fragment of a large colourless crystal, only slightly greyish, very little transparent. The 110 rounded face predominates, 111 is smaller.
Inv. no. 5 size 12 mm.
FG — A 2
Luminescence: inactive (Pl. XXXIV. row 1)

No. 32. Colourless, markedly shiny fragment 111, with very weakly apparent crystal bounding.
Inv. no. 394 size 3.5 mm.
FG — A 1
Luminescence: weak blue

No. 33. Transparent, markedly shiny fragment 111, with very little apparent crystal bounding.
Inv. no. 394 size 2.5 mm.
FG — A 1
Luminescence: weak blue

No. 34. Perfectly transparent fragment 111, with a deep fissure in place of the 110 face.
Inv. no. 394 size 1.5 mm.
FG — A 1
Luminescence: weak blue

No. 35. Perfectly transparent fragment 111, with very imperfect crystal bounding.
Inv. no. 394 size 1.5 mm.
FG — A 1
Luminescence: weak blue

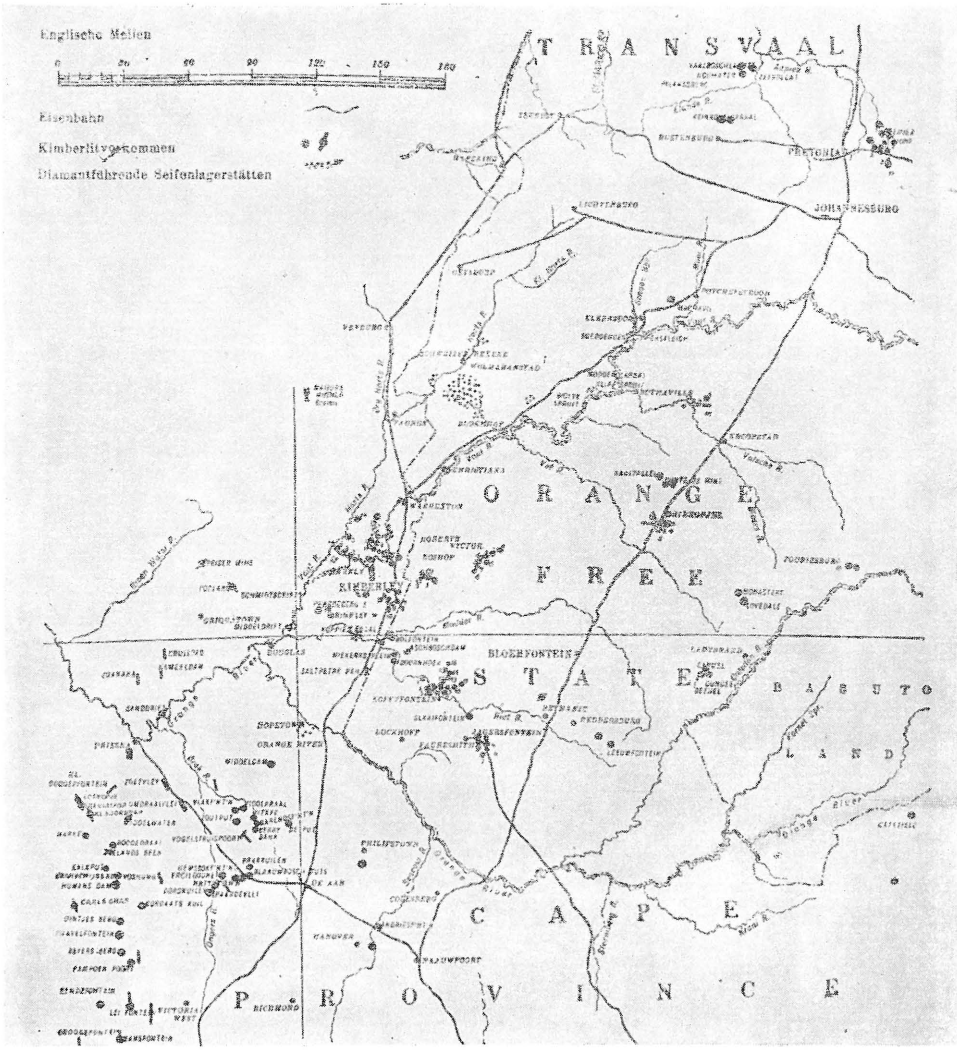
No. 36. Perfectly transparent 111, minutely corroded with deep fissures between faces. Slightly non-uniformly elongated.
Inv. no. 5 size 6.5 mm.
FG — A 1
Luminescence: inactive

No. 37. Perfectly transparent fragment 111, with very imperfect crystal bounding.
Inv. no. 394 size 2 mm.
FG — A 1
Luminescence: inactive

No. 38. Perfectly transparent fragment 111, with very imperfect crystal bounding.
Inv. no. 394 size 1.5 mm.
FG — A 1
Luminescence: inactive

No. 39. Perfectly transparent, heavily rounded and corroded 111, with very imperfect crystal bounding.
Inv. no. 394 size 1.5 mm.
FG — A 1
Luminescence: inactive

No. 40. Perfectly transparent, heavily corroded 111. Faces separated by deep fissures in place of 110 faces.
Inv. no. 7 size 9 mm.
FG — A 1
Luminescence: yellow-green hue
N.B. A unique crystal intergrown with kimberlite (Pl. XXXIII.)



Map. 3. The diamond fields of Southern Africa (according to P. A. Wagner).

No. 41. Colourless, only slightly yellowish, perfectly transparent and lustrous, heavily corroded crystal; rounded 110 faces predominate, smaller 111 with frequent etching.
Inv. no. 5 size 8 mm.
FG — A 2
Luminescence: inactive

No. 42. Almost opaque, well developed tabular spinel-law twin; 111 faces are markedly corroded.
Inv. no. 5 size 9 mm.
Luminescence: inactive (Pl. XXXIV. row 2)

Summary of the results of observations of luminescence of diamonds from Kimberley (nos. 26—42). Among the diamonds of Kimberley locality only two were found of the types determined among the diamonds from the exactly specified locality Wesselton Mine: by far the most frequent type 1. (diamonds with octahedric and rhombododecahedric habit) and a single case resembling type 3. (spinel-law twins).

Among the diamonds of the first type, i. e. type A 1 and A 2 according to Fersman and Goldschmidt (nos. 26—41), there is a number of specimens (nos. 26—31) which are in their morphological bounding, colour and luminescence quite analogous to nos. 2—18 from the Wesselton Mine. Specimens nos. 32—41 display a completely different behaviour. These diamonds, although practically quite transparent, display either no luminescence or a very weak one, differing thus very fundamentally from the diamonds of type 1. from the Wesselton Mine. The fact that some colourless diamonds have only a weak blue luminescence or are completely inactive is mentioned already in the Bauer-Schlossmacher treatise. This finding, however, is in complete disagreement with the above principle of Chaumet since most of the diamonds tested have a clear jewel quality (nos. 32—40). The handly detectable yellow-green luminescence of diamond no. 40 is probably caused by surface impurities, similarly as in nos. 10 and 13. It is interesting to compare the luminescence of the diamonds of type 1. from the Wesselton Mine near Kimberley with that of the diamonds of the same type with only the wider locality "Kimberley" given. It can be definitely assumed on the basis of this comparison that the inactive and weakly luminescent stones originate from one locality, different from the Wesselton Mine.

The only diamond in the form of a spinel-law twin (no. 42) differs morphologically somewhat from the type 3. of Wesselton Mine diamonds (nos. 20—23). White in this case we are dealing with a perfect twin of two octahedra according to the spinel law, all the four cases from the Wesselton Mine are cyclic twins. On account of the opacity of this sample no conclusions can be drawn, however, from their inactivity in UV light.

The general percent participation of the individual morphological and luminescence types from localities of the entire Kimberley region, including the Wesselton Mine are somewhat different from the above review of stones from the Wesselton Mine locality only, especially as far as the ratio of blue-luminescent and inactive diamonds of the first type is concerned. This finding may be compared with the observations of Soviet authors (19) made in the Vilyuy river localities; they also maintain that in this extensive diamond-bearing region the luminescence of diamonds from various localities of the deposit differs substantially.

Table 3.

	Luminescence					
	blue	yelow	orange	anomalous	inactive	
1. type	54 %			10 %	17 %	81 %
2. type		2 %				2 %
3. type			10 %		2 %	12 %
4. type					5 %	5 %
	54 %	2 %	10 %	10 %	24 %	100 %

Union of South Africa (without any detailed localization; the above localities of "Kimberley" and "Wesselton Mine" thus belong to this group, as well).

No. 43. Colourless, perfectly transparent, only very slightly yellowish, irregularly developed 111, without any corrosion marks.
Inv. no. 4 size
FG — A 1
Luminescence: marked blue

No. 44. White, only slightly greyish 111, with a bluish luster, with hardly distinguishable crystal faces.
Inv. no. 4 size 11.5 mm.
FG — A 1
Luminescence: marked blue

No. 45. Transparent, irregularly developed crystal, with very coarse, considerably impure surface; judging from triangular etching mark on the predominant face we are probably dealing with the 111 face.
Inv. no. 4 size 7 mm.
FG — A 1
Luminescence: weak blue

No. 46. Transparent, relatively shiny crystal; 111 faces predominate over 110.
Inv. no. 25 714 size 3 mm.
FG — A 1
Luminescence: inactive
N.B. intergrown with a conglomerate

No. 47. Perfectly transparent, shiny 111; on one side the 110 face predominates over the 111; seemingly hemimorphic development.
Not inventarized size 2.5 mm.
FG — A 1—2
Luminescence: weak blue

No. 48. Transparent, perfectly shiny 111; due to corrosion considerably altered to a striated 110.
Inv. no. 6 size 6 mm.
FG — A 1—2
Luminescence: yellow-green hue
N.B. intergrown with kimberlite (Pl. XXXII.)

No. 49. A transparent, rectangularly cut brilliant with a slight brownish turbidity.
Inv. no. 2 (new precious stones inventory) size 8.0×6.8 mm. weight 0.313 g.
Luminescence: blue

No. 50. A transparent, rectangularly cut brilliant
Inv. no 1 (new precious stones inventory) size 10.1×5.9 mm. weight 0.276 g.
Luminescence: inactive

No. 51. Greyish, shiny, almost opaque, heavily rounded, cyclic spinel-law twin, with a very imperfect crystal bounding.
Inv. no. 4 size 6.5 mm.
Luminescence: inactive

Summary of the results of observation of luminescence of diamonds from the Union of South Africa (nos. 43—51). Among the diamonds from the National Museum collections marked with the very inexact locality "South Africa" the same types were found as among those from Kimberley. Type 1. is by far the most frequent, i. e. type A 1 and A 2 according to Fersman and Goldschmidt; there is a single case of type 3. (cyclic spinel-law twin).

Among the diamonds of type 1. (nos. 43—48) colourless ones can be found, with a blue luminescence (nos. 43—45), quite analogously to the specimens from the Wesselton Mine, as well as diamonds without luminescence or with a very weak one (nos. 46 and 47). The yellow-green hue of luminescence of specimen no. 48 is quite analogous to no. 40 and is undoubtedly caused by surface impurities.

Among the described specimens there are diamonds of this habit extremely irregularly developed. We are dealing here with tabular crystals (nos. 43 and 45) or with seemingly hemimorphic ones (no. 47) just as described by Fersman and Goldschmidt. None of these speciemens, similarly as some of the elongated crystals from the Wesselton Mine and Kimberley, do not differ in their luminescence from normal isometrically developed crystals. Thus no difference was observed here in the luminescence of isometrically and irregularly developed crystals of the same crystals bounding, which is considered possible by the Soviet authors.

With this type 1. of South African diamonds, on account of their luminescence, the two cut diamonds from the precious stones collection of the mineralogical department may be grouped (nos. 49 and 50). The first of the two on account of the fact that blue luminescence was not found with any other type among the examined 48 raw South African diamonds. Similarly the inactive transparent diamond, corresponding to the second case, was not found in any other type.

From specimen no. 51, which is morphologically quite analogous to nos. 20—23 from the Wesselton Mine, no conclusions may be drawn on account of its opacity.

The general percentage of morphological and luminescence types among all the 50 South African diamonds from the collections of the mineralogical department is shown in the following table which does not much differ from the review of the diamonds from Kimberley.

5*

Table 4

	Luminescence					
	blue	yelow	orange	anomalous	inactive	
1. type	54 %			10 %	18 %	82 %
2. type		2 %				2 %
3. type			8 %		4 %	12 %
4. type					4 %	4 %
	54 %	2 %	8 %	10 %	26 %	100 %

Lüderitz Bay (Southwest Africa)

No. 52. Bright golden yellow, shiny, perfectly transparent 111, with minute 110 faces, slightly rounded.
Inv. no. 6818 size 3.5 mm.
FG — A 1
Luminescence: weak yellow (Pl. XXXIV. row 2)

No. 53. Bright golden yellow, shiny, perfectly transparent 110, with hardly distinguishable 111, markedly rounded.
Inv. no. 6819 size 4 mm.
FG — A 2
Luminescence: weak blue (Pl. XXXIV. row 2)

In the collections of the mineralogical department of the National Museum there are only 2 specimens of diamonds from Lüderitz Bay Thus it is impossible to make any conclusions on the basis of these two observations. In spite of that, however, there is the very striking yellow luminescence of diamond no. 52 bounded practically solely by 111 faces, as compared with the blue luminescence of diamond no. 53, bounded practically only by 110 faces. This fact is even more marked if we consider that these two specimens have exactly the same colour, which in both cases may be taken for the true diamond colour. The explanation of this difference in luminescence is even more difficult as the origin of dodecahedric crystals of diamonds is mostly explained only by the corrosion of the original octahedric crystals.

According to the Bauer-Schlossmacher treatise golden-yellow diamonds should have a weak brown-yellow luminescence. It is certainly of interest that an analogous brown-yellow luminescence has not been observed by the authors of this paper, either among the mineralogical department collections or among the specimens studied in the Institute for Precious Metals. Both the specimens from Lüderitz Bay differ in their colour and in one case also in luminescence from the morphologically identical diamonds of type 1. (A 1 and A 2 according to Fersman and Goldschmidt) from South African localities.

Kasai River (deposit 800 km. east of Léopoldville, Belgian Kongo)

No. 54. White, turbid, transparent 110, imperfectly bounded and rounded.
Inv. no. 25 856 size 4 mm.
FG — A 2
Luminescence: pinkish
(Pl. XXIV. row 3)

No. 55. Yellowish crystal. Predominating 111 faces, less frequent 110 and 100, only with minute etching. Markedly hemihedric, surface impure.
Inv. no. 25 856 size 6 mm.
FG — B 1
Luminescence: shines through with pink colour
(Pl. XXIV. row 3)

Similarly the two specimens from Belgian Kongo cannot serve as a basis for conclusions. Both specimens belong to the type 1. of diamonds. The first belongs to type A 2 according to Fersman and Goldschmidt, the second to the rare type B 1, which is analogous to no. 18 from the Wesselton Mine in Kimberley. By its pink luminescence it differs substantially from all diamonds from South African localities as well as from those from Lüderitz Bay which resemble in its yellowish colour no. 55. The true colour of no. 54 cannot be determined on account of the white turbidity.

Alaska.

No. 56. Colourless, only slightly brownish, markedly shiny fragment of crystal with predominating 110 faces.
Not inventarized size 3 mm.
FG — A 2
Luminescence: inactive

Diamond no. 56 belongs to the most common type 1. of diamonds, i. e. to the A 2 type of Fersman and Goldschmidt. By its morphology, colour and inactivity of luminescence it is completely analogous to no. 41 from Kimberley.

Rio Tejuco in the state Minas Geraes

No. 57. Colourless 111, with numerous black parts. The 111 faces are separated by fissures in the place of 110 faces.
Inv. no. 6825 size 2.5 mm.
FG — A 1
Luminescence: blue, shining from the inside

No. 58. Colourless inside, on the surface yellowish 111, with minute 110 faces.
Inv. no. 6825 size 2 mm.
FG — A 1
Luminescence: zonar, surface yellow-green, inside blue

No. 59. Colourless, perfectly clear, only very little yellowish, 110, with faces without any corrosion marks, elongated along the trigonal axis (pseudohexagonal development).
Inv. no. 6825 size 3.5 mm.
FG — A2
Luminescence: marked blue

No. 60. White, bluish, translucent, irregularly elongated 110, moderately rounded, not corroded.
Inv. no. 6825 size 2 mm.
FG — A 2
Luminescence: bluish

No. 61. Grey-blue, completely opaque, irregularly elongated along the trigonal axis, moderately rounded, not corroded.
Inv. no. 6825 size 2 mm.
FG — A 2
Luminescence: inactive

All the studied specimens originating from Rio Tejuco (no. 57—61) belong to the first type of diamonds (type A 1 and A 2 of Fersman and Goldschmidt). According to these authors, in all Brazilian localities there are more abudant diamonds bounded by rhombododecahedric faces than by the octahedric ones. Thus this represents a similar case as in Sout-west Africa and a different one than in the South African localities. The distribution of the specimens studied here is in good argreement with the observation of the above authors, five of the specimens possessing predominating 111 faces and three of them 110 faces.

Otherwise the studied specimens are in their morphology, colour and luminescence quite analogous to the diamonds from the Wesselton Mine (nos. 2—17). Their luminescence is blue and its intensity is proportional to the purity of the diamond. Only specimen no. 58 is anomalous in its typical zonar luminescence, not unlike in no. 14. The yellow-green luminescence of the crystal surface in not caused by surface impurities in this case, unlike in nos. 10 and 13. The zonality of luminescence is here in complete agreement with the zonar coloration of the crystal which is colourless inside and yellow on the surface The yellowish colour of the crystal surface in no. 58 is completely different than the yellowish colour of no. 59. It can be assumed that whereas the colour of no. 59 is of a purely mechanical nature the surface zone of crystal no. 58 represents the true colour of the diamonds. The yellow-green luminescence is according to Bauer and Schlossmacher in full agreement with the yellow colour of the diamond.

Minas Geraes (without exact localization; the above locality of Rio Tejuco lies in the state Minas Geraes)

No. 62. Tiny brown-black, completely opaque grains without any marked bounding.
Inv. no. 6827
Luminescence: inactive
N. B. intergrown with diamond-bearing conglomerate (cascalho)
Pl. XXXV.

Diamond no. 62 represents a typical example of opaque bort without any crystal bounding. As such it never luminesces.

Bahia

No. 63. Coarsely granular carbonado without any crystal faces, black-brown.
Inv. no. 6826 size 10.5 mm.
Luminescence: inactive
(Pl. XXXIV. row 3)

Carbonado (bort) no. 63 is completetly analogous to no 62.

Brazil (without exact localization; thus the above localities marked Minas Geraes, Rio Tejuco and Bahia belong into this group).

N. 64. Transparent, imperfectly bounded 111, with bluish luster.
Inv. no. 1 size 2.5 mm.
FG — A 1
Luminescence: marked blue

Map. 4. The diamond fields of Brazil
(according to Bauer — Schlossmacher — 22).

No. 65. White 111 with a bluish luster with minute 110 faces.
111 faces are slightly corroded.
Inv. no. 6822 size 7 mm.
FG — A 1
Luminescence: marked blue (Pl. XXXIV. row 4)

No. 66. Colourless, with only slight yellow-green turbidity, 111, with large 110 faces, coarsely striated.
Inv. no. 1 size 2.5 mm.
FG — A 1
Luminescence: weak blue

No. 67. Colourless, only slightly yellowish, somewhat irregularly developed 111 with heavily corroded faces.
Inv. no. 1 size 2 mm.
Luminescence: weak blue

No. 68. Colourless, only slightly brownish crystal fragment, formed by 111 faces and cleavage forms and with smaller striated 110 faces.
Inv. no. 1 size 2 mm.
FG — A 1
Luminescence: weak blue

No. 69. Transparent, with slight turbidity, 111, with slinghtly corroded faces.
Inv. no. 36 898 size 1 mm.
FG — A 1
Luminescence: weak blue

No. 70. White, only slightly grey 111, with heavily corroded little marked faces, hemihedric.
Inv. no. 1 size 3 mm.
FG — A 1
Luminescence: marked blue

No. 71. Colourless, only slightly brownish, cleavable crystal fragment, formed by striated 110 faces.
Inv. no. 1 size 3 mm.
FG — A 2
Luminescence: marked blue

No. 72. Perfectly transparent, somewhat tabular crystal with bluish luster, formed by moderately rounded 110 faces.
Inv. no. 1 size 3 mm.
FG — A 2
Luminescence: marked blue

No. 73. Transparent, bluish, shiny, very irregularly developed 110.
Inv. no. 1 size 2 mm.
FG — A 2
Luminescence: marked blue

No. 74. Perfectly transparent, very irregularly developed and rounded 110, with bluish luster.
Inv. no. 1 size 2 mm.
FG — A 2
Luminescence: deep blue

No. 75. Colourless, only slightly brown, translucent, heavily rounded with corroded 110, with frequent uneven corrosion pits.
Inv. no. 2 size 3.5 mm.
Luminescense: deep blue (Pl. XXXVI. row 1)

No. 76. Colourless, only slightly brown, markedly rounded 110, somewhat elongated.
Inv. no. 2 size 4.5 mm.
FG — A 2
Luminescence: marked blue (Pl. XXXVI. row 1)

No. 77. White 110, with bluish luster, translucent, completely spherical, heavily corroded on the surface.
Inv. no. 3 size 7 mm.
FG — A 2
Luminescence: marked blue (Pl. XXXIV. row 4)

No. 78. Two white, ranging to slightly grey, congresced 110, spherically rounded, heavily corroded on the surface.
Inv. no. 3 size 7.5 mm.
FG — A 2
Luminescence: marked blue (Pl. XXXIV. row 4)

No. 79. White, ranging to slightly grey-brown, concretion of two 110, markedly rounded.
Inv. no. 2 size 5.5 mm.
FG — A 2
Luminescence: blue (Pl. XXXVI. row 2)

No. 80. Colourless, only slightly brown 110, heavily rounded, at places with deep corrosion pits.
Inv. no. 2 size 4 mm.
FG — A 2
Luminescence: blue (Pl. XXXVI. row 5)

No. 81. Colourless, with only slight greenish turbidity, 110, with rounded faces.
Inv. no. 6821 size 2 mm.
FG — A 2
Luminescence: blue

No. 82. Colourless, only slightly greenish, transparent 110, with rounded faces.
Inv. no. 6821 size 1.5 mm.
FG — A 2
Luminescence: blue

No. 83. Colourless, only slightly yellowish, with irregular tabular development, 110, with striated faces and hardly detectable 111 faces.
Inv. no. 1 size 3.5 mm.
FG — A 2
Luminescence: weak blue

No. 84. Colourless, with only slight grey turbidity, very imperfectly developed 110.
Inv. no. 1 size 2 mm.
FG — A 2
Luminescence: weak blue

No. 85. Colourless, only slightly yellowish 110, transparent, markedly streated, at places with clear 111 faces.
Inv. no. 6823 size 3.5 mm.
FG — A 2
Luminescence: bluish

No. 86. Colourless, only slightly yellowish 110, very imperfectly developed, with deep corrosion pits in the place of possible faces.
Inv. no. 36 898 size 1 mm.
FG — A 2
Luminescence: weak blue

No. 87. Colourless, with only brown turbidity, very unclearly developed 111, with a deep corrosion pit in the place of face 100.
Inv. no. 1 size 2.5 mm.
FG — B 4
Luminescence: inactive

No. 88. Transparent, with tabular irregular development, 110, very markedly rounded, with a clear corrosion pit.
Inv. no. 1 size 3 mm.
FG — A 2
Luminescence: weak blue

No. 89. Transparent, perfectly shiny, somewhat irregularly developed 110, with minute 111 faces.
Inv. no. 1 size 2 mm.
FG — A 2
Luminescence: weak blue

No. 90. Transparent crystal fragment with apparent cleavage. Very unclear 110 faces predominating.
Inv. no. 1 size 3 mm.
FG — A 2
Luminescence: weak blue

No. 91. Transparent, heavily rounded 110.
Inv. no. 1 size 2 mm.
FG — A 2
Luminescence: weak blue

No. 92. Perfectly transparent, shiny 111 with little striations between faces, practically without etching.
Inv. no. 6820 size 4 mm.
FG — A 1
Luminescence: inactive

No. 93. Greenish, with irregular tabular development, 110, with dull faces.
Inv. no. 1 size 3 mm.
FG — A 2
Luminescence: blue-green

No. 94. Group of two green 110, with striated faces and sharp edges.
Inv. no. 2 size 5 mm.
FG — A 2
Luminescence: blue-green (Pl. XXXVI. row 1)

No. 95. Greenish with greyish turbidity, 110, with very imperfect slightly corroded faces.
Inv. no. 2 size 3.5 mm.
FG — A 2
Luminescense: blue-green (Pl. XXXVI. row 2)

No. 96. Yellow-green 110, markedly striated, with clear edges, but very uneven faces.
Inv. no. 6823 size 3.5 mm.
FG — A 2
Luminescence: blue-green

No. 97. Brown 110, somewhat rounded and elongated with little distinguishable 111 face and small corrosion pits.
Inv. no. 2 size 5 mm.
FG — A 2
Luminescence: blue-green (Pl. XXXVI. row 3)

No. 98. Brown 110 heavily rounded, with small corrosion pits.
Inv. no. 2 size 3.5 mm.
FG — A 2
Luminescence: blue-green (Pl. XXXVI. row 2)

No. 99. Brown 110, somewhat rounded and irregularly developed.
Inv. no. 2 size 3.5 mm.
FG — A 2
Luminescence: blue-green (Pl. XXXVI. row 3)

No. 100. Brown, very heavily rounded 110.
Inv. no. 2 size 4.5 mm.
FG — A 2
Luminescence: blue-green (Pl. XXXVI. row 3)

No. 101. Transparent, irregularly cut lozenge, with greenish luster.
Inv. no. 3 (new inventory of precious stones) size 4 X 3 mm.
Luminescence: blue-green

No. 102. Light-green 110, very markedly rounded, with almost indistinguishable uniformly corroded faces.
Inv. no. 2 size 3.5 mm.
FG — A 2
Luminescence: intense yellow-green (Pl. XXXVI. row 4)

No. 103. Yellow-green, irregularly developed crystal, markedly tetrahedrically symmetrical, with predominating 110 face and marked 111 face.
Inv. no. 2 size 2.5 mm.
FG A 2
Luminescence: yellow-green (Pl. XXXVI. row 2)

No. 104. Pure yellow, irregularly developed 110, with imperfect faces and frequent corrosion pits.
Inv. no. 1 size 3 mm.
FG — A 2
Luminescence: yellow-green

No. 105. Pure yellow, heavily corroded, fragment 110, very imperfectly bounded.
Inv. no. 1 size 1.5 mm.
FG — A 2
Luminescence: yellow-green

No. 106. Rich yellow, heavily rounded 110, with very unclear faces.
Inv. no. 6824 size 3 mm.
FG — A 2
Luminescence: yellow-green

No. 107. Yellow with brown turbidity, 110, unclearly striated, slightly rounded.
Inv. no. 6823 size 5 mm.
FG — A 2
Luminescence: yellow-green

No. 108. Yellow with brown turbidity 110, elongated along one of the principal axes, thus forming seemingly tetragonal symmetry.
Inv. no. 6823 size 3.5 mm.
FG — A 2
Luminescence: yellow-green

No. 109. Yellow with brown turbidity 110, heavily rounded, with little distinguishable. 111 face.
Inv. no. 6824 sice 4.5 mm.
FG — A 2
Luminescence: yellow-green

No. 110. Brownish, markedly shiny, irregularly developed 110, moderately rounded.
Inv. no. 1 size 2 mm.
FG — A 2
Luminescence: yellow-green

No. 111. Brown, elongated along the axis of trigonal symmetry 110.
Inv. no. 2 size 3 mm.
FG — A 2
Luminescence: yellow-green (Pl. XXXVI. row 1)

No. 112. Brown 110, rounded, heavily corroded at places.
Inv. no. 2 size 3.5 mm.
FG — A 2
Luminescence: weak yellow-green (Pl. XXXVI. row 4)

No. 113. Transparent crystal with a yelow part, markedly shiny; striated, irregularly developed 110 faces with a deep corrosion pit and with traces of 111 faces.
Inv. no. 2 size 3.5 mm.
FG — A 2
Luminescence: weak yellow-green (Pl. XXXVI. row 5)

No. 114. Yellow brilliant with brownish turbidity.
Inv. no. 4 (new inventory of precious stones)
diameter 1.8 mm.
weight 0.010 g.
Luminescence: weak yellow-green

No. 115. Yellow, oval-cut lozenge.
Inv. no. 5 (new inventory of precious stones)
size 4.2 × 3.1 mm.
weight 0,027 g.
Luminescence: yellow-green

No. 116. Yellow fragment of an irregularly elongated 110, with small 111 faces.
Inv. no. 1 size 3 mm.
FG — A 2
Luminescence: yellow

No. 117. Yellow 110, somewhat irregularly developed and rounded.
Inv. no. 1 size 2.5 mm.
FG — A 2
Luminescence: yellow

No. 118. Yellow fragment of 110, with badly defined crystal bounding.
Inv. no. 1 size 2 mm.
FG — A 2
Luminescence: yellow

No. 119. Extremely columnarily elongated, clear yellow crystal, formed by 110 faces.
Inv. no. 1 size 3 mm.
FG — A 2
Luminescence: pink

No. 120. Yellow crystal fragment, bounded by unclear 110 faces.
Inv. no. 1 size 2.5 mm.
FG — A 2
Luminescence: pink

No. 121. Yellow-brown crystal fragment, bounded by unclear 110 faces.
Inv. no. 1 size 2.5 mm.
FG — A 2
Luminescence: pink

No. 122. Yellow crystal fragment, bounded by unclear 110 faces.
Inv. no. 1 size 2 mm.
FG — A 2
Luminescence: pink

No. 123. Yellowish fragment of a somewhat rounded crystal, bounded by badly defined 110 faces.
Inv. no. 1 size 2 mm.
FG — A 2
Luminescence: pink

No. 124. Yellow crystal, bounded by hardly distinguishable 110 faces.
Inv. no. 1 size 3 mm.
FG — A 2
Luminescence: pink

No. 126. Pinkish, heavily rounded crystal, bounded by hardly distinguishable 110 faces, with small corrosion pits.
Inv. no. 1 size 2 mm.
FG — A 2
Luminescence: pink

No. 127. Yellow, moderately rounded crystal fragment, bounded by hardly distinguishable 110 faces.
Inv. no. 1 size 2.5 mm.
Luminescence: inactive

No. 128. Yellow crystal fragment, bounded by hardly distinguishable 110 faces.
Inv. no. 1 size 1.5 mm.
FG — A 2
Luminescence: inactive

No. 129. Clear yellow, markedly rounded crystal fragment, bounded by hardly distinguishable 110 faces.
Inv. no. 1 size 1.5 mm.
FG — A 2
Luminescence: inactive

No. 130. Yellowish, elongated 110, heavily corroded and rounded.
Inv. no. 6823 size 4 mm.
FG — A 2
Luminescence: inactive

No. 131. Fragment of a yellow, perfectly transparent, irregularly cut lozenge.
Inv. no. 6 (now inventory of precious stones)
size 2.9 × 1.8 mm.
weight 0,013 g.
FG — A 2
Luminescence: inactive

No. 132. Brown-red, columnarily elongated crystal, very heavily rounded, with hardly distinguishable traces of 110 faces.
Inv. no. 1 size 3.5 mm.
FG — A 2
Luminescence: inactive

No. 133. Brown-red, markedly shiny crystal with frequent inclosures, irregularly developed, with unclear 110 faces and deep corrosion pits.
Inv. no. 1 size 3 mm.
FG — A 2
Luminescence: inactive

No. 134. Brown-red, somewhat rounded crystal with unclear 110 faces.
Inv. no. 1 size 2 mm.
FG — A 2
Luminescence: inactive

No. 135. Brown-red fragment of triangular cross-section, bounded by hardly distinguishable 110 faces.
Inv. no. 1 size 2 mm.
FG — A 2
Luminescence: inactive

No. 136. Brown-red 110, elongated along the axis of trigonal symmetry, rounded.
Inv. no. 2 size 4.5 mm.
FG — A 2
Luminescence: inactive

No. 137. Brown-red 110, elongated along the axis, of trigonal symmetry, somewhat rounded.
Inv. no. 2 size 3 mm.
FG —A 2
Luminescence: inactive (Pl. XXXVI. row 3)

No. 138. Brown-red, markedly shiny 110, striated, somewhat irregularly elongated, with marked 111 faces.
Inv. no. 2 size 4 mm.
FG — A 2
Luminiscence: inactive (Pl. XXXVI. row 4)

No. 139. Brown-red 110, markedly elongated and rounded.
Inv. no. 2 size 5 mm.
FG — A 2
Luminescence: inactive (Pl. XXXVI. row 4)

No. 140. Yellow-brown rounded crystal fragment, bounded by hardly distinguishable 110 faces.
Inv. no. 1 size 2 mm.
FG — A 2
Luminescence: inactive

No. 141. Perfectly transparent, yellow-brown brilliant.
Inv. no. 4 (new inventory of precious stones)
diameter 2.4 mm.
weight 0.017 g.
Luminescence: inactive

No. 142. Honey-coloured, not very perfectly bounded 100, with heavily corroded faces. Edges are truncated by 110 faces.
Not inventarized size 4.5 mm.
FG — D 1
Luminescence: orange

No. 143. Honey-coloured twin fragment concresced according to the spinel law.
Inv. no. 36 898 size 2 mm.
Luminescence: intense orange

No. 144. Honey-coloured rounded twin fragment, concresced according to the spinel law.
Inv. no. 36 898 size 1.5 mm.
Luminscence: orange

No. 145. Honey-coloured, somewhat rounded twin fragment concresced according to the spinel law.
Inv. no. 36 898 size 1 mm.
Luminescence: orange

No. 146. Impure, honey-coloured, imperfectil developed tabular crystal bounded by 110 faces. twinnily concresced according to the spinel law.
Inv. no. 2 size 4 mm.
Luminescence: orange

No. 147. White, spinel-law twin with grey turbidity.
Inv. no. 1 size 3.5 mm.
Luminescence: light blue

No. 148. Transparent crystal of triangular shape with marked 111 faces.. Spinel-law twin.
Inv. no. 36 898 size 1.5 mm.
Luminescence: blue

No. 149. Transparent crystal of triangular contour, spinel-law twin.
Inv. no. 36 898 size 1.5 mm
Luminescence: light blue

No. 150. Colourless crystal with black impurities of triangular shape with a marked 111 face on one side. Spinel-law twin.
Inv. no. 36 898 size 1 mm.
Luminescence: inactive

No. 151. Colourless, only slightly brownish spinel-law twin.
Not inventarized size 3.5 mm.
Luminescence: inactive

No. 152. Grey-white turbid concretion of two 111, without any marked regularity. The crystals have the corroded faces rounded on the edges and with various structures at the points.
Inv. no. 6823 size 5.5 mm.
Luminescence: inactive

No. 153. Transparent, perfectly cut rosette, only slightly yellowish.
Inv. no. 9 (new inventory of precious stones)
size 7.1 × 6.2 mm.
weight 0.151 g.
Luminescence: marked blue

No. 154. Completely transparent, irregularly cut lozenge.
Inv. no. 3 (new inventory of precious stones)
size 4.5 × 4.5 mm.
Luminescence: blue

No. 155. Perfectly transparent, irregularly cut lozenge.
Inv. no. 3 (new inventory of precious stones)
size 5 × 3 mm.
Luminescence: blue

No. 156. Perfectly transparent, irregularly cut lozenge.
Inv. no. 3 (new inventory of precious stones)
size 3.5 × 3 mm.
Luminescence: blue

No. 157. Perfectly transparent, irregularly cut lozenge, with bluish luster.
Inv. no. 3 (new inventory of precious stones)
size 3.5 × 2.5 mm.
Luminescence: blue

No. 158. Transparent, irregularly cut rectangular lozenge with very slight yellow turbidity.
Inv. no. 8 (new inventory of precious stones)
size 4.5 × 3.8 mm.
weight 0.026 g.
Luminescence: blue

No. 159. Transparent, irregularly cut lozenge, with only slight brown turbidity.
Inv. no. 10 (new inventory of precious stones)
size 4.8 × 4.0 mm.
weight 0.054 g.
Luminescence: blue

No. 160. Transparent rosette with only slight brown turbidity.
Inv. no. 7 (new inventory of precious stones)
diameter 1.9 mm.
weight 0.006 g.
Luminescence: weak blue

No. 161. Transparent, irregularly cut rectangular lozenge, with very slight yellow turbidity.
Inv. no. 8 (new inventory of precious stones)
size 6.4 × 5.1 mm.
weight 0.099 g.
Luminescence: weak blue

No. 162. Perfectly clear, irregularly cut lozenge.
Inv. no. 3 (new inventory of precious stones)
size 4.5 × 3.0 mm.
Luminescence: blue

No. 163. Lozenge with white turbidity, opaque, irregularly cut.
Inv. no. 3 (new inventory of precious stones)
size 1.5 × 1.0 mm.
Luminescence: inactive

Summary of observation results of luminescence of Brazilian diamonds (nos. 64—163). Among the diamonds from the collections of the mineralogical department of the National Museum, marked with the vague locality "Brazil" in general analogous morphological types were found as among those from South African localities. They are as follows:

1) crystals of octahedric ranging to rhombododecahedric habit,

2) an imperfectly bounded crystal of cubic habit,

3) twins concresced according to the spinel law,

4) an imperfectly bounded concretion of two octahedric crystals without any apparent regularity of growth.

The most common type is again the first one, similarly as in all the world localities. It differs from the South African specimens by the abovementioned reserve ratio of crystals with predominant octahedric faces to those with predominantly rhombododecahedric ones. Of the total of 73 crystals of this type only 8 have the octahedron predominating. This number also includes 1 crystal with a marked hemihedric development (combination of two tetrahedra no. 70) and one octahedron with deep corrosion pits in the place of cubic faces (no. 87), which according to Fersman and Goldschmidt belongs to the transitional type B 4 and resembles morphologically diamond no. 18 from the Wesselton Mine.

Brazilian diamonds of type 1. differ substantially from the South African ones of the same type by an extraordinary diversity both in crystal colour and in luminescence. With respect to the colour and luminescence the diamonds can be divided into two groups:

a) colourless, white to bluish,

b) coloured, especially yellow, green and brown.

Diamonds of group 1a are perfectly analogous to the South African ones of type 1. as well as to the specimens from the Rio Tejuco locality (nos. 57—61). To the 1b group belongs among others also the Bohemian diamond from Dlažkovice (no. 1), further diamonds from Lüderitz Bay (nos. 52 and 53) and apparently also the diamonds from Belgian Kongo (no. 54 and 55). The extraordinary diversity in colour and luminescence among the Brazilian diamonds is undoubtedly caused by the fact that we are dealing here with many different localities from a very extenzive area (see the attached map). It is likely that a study of exactly localized diamonds from Brazilian localities would provide more unequivocal results, as indicated by the five specimens from Rio Tejuco.

It is of interest that all the crystals of type A 1 according to Fersman and Goldschmidt (octahedric habit) belong by its colour and luminescence into group 1a. Similarly as analogous South African diamonds, the Brazilian ones of group 1a can be divided into those whith blue luminescence (these are predominant, the luminescence being proportional to their transparency, nos 64—87) and into the minority of specimens with weak blue or inactive luminescence regardless of their transparency (nos. 88—92).

Among the Brazilian diamonds of type 1a and 1b there is a number of extremely elongated crystals, both tabularly and along the trigonal axis. Similarly as with the elongated South African crystals mentioned above there is no difference in luminescence here from identically bounded crystals of completely isometric development.

Group 1b is much more diverse than group 1a; it includes coloured diamonds, mostly yellow. yellow-green, green and brown. The yellow, yellow-green and green colours represent here the true colour of the diamond. The brown colour is problematic. Whereas in some of them, such as the brown-red ones (nos. 132—139) and the yellow-brown (nos. 140—141) it may be assumed that the colour is the true original one, but with a number of others (nos. 97—100 and 110—112) we are dealing probably with a mechanical admixture, frequently detected in colourless diamonds (e. g. no. 68 from Brazil, no. 5 from the Wesselton Mine and several others) which covers the original lighter colour, in this case yellow, yellow-green and green.

It was found generally that Brazilian diamonds of a green to yellow-green colour have a blue-green (nos. 93—96) or yellow-green (nos. 102—103) luminescence, those of yellow colour have a yellow-green (nos. 104—199), yellow (nos. 116—118), pink (nos. 119—125) or inactive (nos. 127—130) luminescence. The only pinkish diamond (no. 126) has a pink luminescence. The luminescence as related to the diamond colour corresponds thus mostly to the data given by Bauer-Schlossmacher. According to these authors yellow-green luminescence is shown by bright green, green-yellow to clear yellow diamonds, green-yellow and honey-coloured ones have a green-yellow luminescence and honey-coloured and brown-red (slightly yellow) ones have a yellow luminescence. The pink and blue-green luminescence is not mentioned by Bauer-Schlossmacher, light pink diamonds should have a very weak blue luminescence.

It is clear in all the diamonds with yellow-green luminescence (nos. 102—115) that the intensity of luminescence is proportional to the purity of the stone, in agreement with the view of Chaumet. An exception is formed here to a certain extent by specimen no. 113, in which the weak yellow-green luminescence appears to be caused by the yellow part of the crystal. We are thus dealing here basically with a zonality of a transparent inactive diamond (analogous e. g. to nos. 88—92 with a yellow diamond with a yellow-green luminescence. With other colour hues of luminescence the validity of this principle cannot be assumed with regard to the complete inactivenes of some yellow diamonds (nos. 127—131).

In view of the bluegreen and yellow-green luminescence not observed with other Brazilian diamond types, also the three cut diamonds from the collection of the mineralogical department of the National Museum were put into this group. With nos. 114 and 115 this classification is also supported by their yellow colour, with the transparent colourless lozenge no. 101 then by its marked green lustre. For analogous reasons lozenge no. 131 was grouped with the inactive yellow diamonds of this type, and the yellow-brown brilliant no. 141 with the inactive brown diamonds.

Type 2. from Brazil is represented in the National Museum collections by a single specimen (no. 142). Morphologically it is completely analogous with diamond no. 19 from the Wesselton Mine from which it differs only in its colour tinge and luminescence. It is of interest to compare it with the morphologically completely different diamonds nos. 20—23 (cyclic spinel-law twins) from the Wesselton Mine with which it has the same honey colour and orange luminescence. This coincidence of colour and luminescence between morphologically completely different diamonds from different localities is very striking, especially on account of the fact that the orange luminescence is very rare.

Type B. (nos. 143—151) from Brazil represents throughout twinny concretions thereby differing from the same type from the Wesselton Mine (nos. 20—23), where cyclic concretions occur. It is thus completely analogous with no. 42 from Kimberley. According to their colour and luminescence diamonds of this type can be divided into two groups:

a) honey-coloured twins with orange luminescence (nos. 143—146);

b) colourless or white twins with blue luminescence (nos. 147—151).

Group 3a is in all respects analogous to diamonds nos. 20—23 from the Wesselton Mine if the above-mentioned difference between twinny and cyclic concretions is disregarded. Thus it can be assumed that this double type of regular concretion does not affect the difference in colour and in luminescence. It is also of interest to compare the specimens with no. 142 of cubic habit which is also honey-coloured with orange luminescence. With four twins possessing orange luminescence it may be said that the intensity of luminescence is again directly proportional to crystal transparency.

Group 3b, represented by colourless twins formed according to the spinel law (nos. 147—151) displays a completely analogous luminescence as type 1a (nos. 64—87), i. e. blue. Similarly as with that type there appears to exist a proportionality between the intensity of luminescence and crystal purity. This it the reason why the considerably impure diamonds nos. 150 and 151 do not show any luminescence. Thus it can be said that colourless or white spinel-law twins behave quite analogously as if they represented crystal individuals. The question arises whether the morphological identification is correct and whether the above five cases do not represent imperfectly developed crystals of type 1.

Type 4. is among the Brazilian specimens represented by a single stone (no. 152): in can be compared with similar specimens from the Wesselton Mine (nos. 24 and 25). On account of opacity of this sample the UV light inactivity observed here cannot serve as basis for any conclusions. The grey-white turbidity makes it impossible to determine the true colour of this diamond.

Out Brazilian diamonds from the National Museum collections were included in the corresponding groups it those cases where on account of colour and luminescence their classification may be considered as incontestable (nos. 101, 114, 115, 131 and 141). The colourless stones with a blue luminescence still remain ambiguous (nos. 153—162): they belong most probably to the type of diamonds with octahedric or rhombododecahedric habit 1a (nos. 64—87) but they may also belong to twin concretions according to the spinel law (type 3b, nos. 147—151). Similarly the opaque lozenge from Brazil (no. 163) cannot be classified with certainty. In the present paper these cut diamonds are included only because they permit to determine more exactly the percentage of luminescence types from Brazilian localities.

The total percent distribution of the individual morphological and luminescence types of all the 107 Brazilian diamonds from the mineralogical department of the National Museum, including the specimens from Rio Tejuco and Minas Geraes and Bahia, is shown in the attached Table, which in quite substantially different from the analogous Tables for South African localities.

The difference consists mainly in the great diversity of luminescence types among Brazilian diamonds as compared with the South African ones, particularly in the type 1. of diamonds of octahedric, ranging to rhombo-dodecahedric habit. Whereas all the investigated South African diamonds of this type belong to group 1a, i. e. to colourless or white diamonds with blue or inactive luminescence, the majority of Brazilian diamonds belong to group 1b, i. e. to coloured diamonds, luminescing with various colours. At the same time, the per cent participation of type 1. in relation to the other types is practically identical in both of the largest diamond-bearing regions (South Africa 82%, Brazil 77—87%, including the cut stones no. 153—163, which undoubtedly belong here, as well). In the final result this difference is manifested by the substantially lower percentage of blue luminescence with Brazilian diamonds than with the South African ones.

Table 5

	Luminescence								
	blue	blue-green	yellow-green	yellow	pink	orange	zonale	inactive	
1a type	28 %							3 %	31 %
1b type		8 %	13 %	3 %	7 %			14 %	45 %
1a+b type							1 %		1 %
2. type						1 %			1 %
3a type						4 %			4 %
3b type	3 %							2 %	5 %
4. type								1 %	1 %
bort								2 %	2 %
?	9 %							1 %	10 %
	40 %	8 %	13 %	3 %	7 %	5 %	1 %	23 %	100 %

Australia (without exact localization)

No. 164. Perfectly transparent, with only minute yellow turbidity, 110, irregularly developed and rounded.
Inv. no. 8 size 4 mm.
FG — A 2
Luminescence: marked blue
(Pl. XXXVII. row 1)

No. 165. Perfectly transparent, with only minute yellow turbidity, 110, very irregularly developed and somewhat rounded.
Inv. no. 8 size 3.5 mm.
FG — A 2
Luminescence: marked blue
(Pl. XXXVII. row 1)

No. 166. Perfectly transparent, rounded 110
Inv. no. 8 size 3.5 mm.
FG — A 2
Luminescence: blue
(Pl. XXXVI. row 1)

No. 167. Perfectly transparent 110, irregularly developed, with unclear rounded faces.
Inv. no. 8 size 3 mm.
FG — A 2
Luminescence: blue
(Pl. XXXVI. row 3)

No. 168. Transparent, with only very slight yellow turbidity, 110, irregularly elongated and markedly rounded.
Inv. no. 8 size 4 mm.
FG — A 2
Luminescence: blue
(Pl. XXXVII. row 2)

No. 169. Transparent, with only slight yellowish turbidity, 110, irregularly developed, with unclear 111 faces. It makes a hemihedric impression.
Inv. no. 8 size 3.5 mm.
FG — A 2
Luminescence: blue
(Pl. XXXVII. row 2)

No. 170. Perfectly transparent, markedly rounded. irregularly elongated, 110, with unclear faces.
Inv. no. 8 size 4 mm.
FG — A 2
Luminescence: weak blue
(Pl. XXXVII. row 3)

No. 171. Transparent, with slight turbidity, irregularly developed, tabular crystal, markedly rounded, bounded by hardly distinguishable 110 faces.
Inv. no. 8 size 3.5 mm.
Luminescence: weak blue
(Pl. XXXVII. row 4)

No. 172. Colourless, with only slight yellowish turbidity, tabular crystal, very markedly rounded, bounded by hardly distinguishable 110 faces.
Inv. no. 8 size 4 mm.
Luminescence: weak blue
(Pl. XXXVII. row 4)

No. 173. Colourless, with only slight yellowish turbidity, bounded by hardly distinguishable 111 faces. It makes a hemihedric impression.
Inv. no. 8 size 3.5 mm.
FG — A 1
(Pl. XXXVII. row 5)
Luminescence: weak blue
(Pl. XXXVII. row 5)

No. 174. Colourless, with only slight yellowish turbidity, markedly rounded, irregularly elongated crystal, bounded by unclear 110 faces.
Inv. no. 8 size 3 mm.
FG — A 2
Luminescence: weak blue
(Pl. XXXVII. row 3)

Map. 5. The diamond fields of Australia
(according to Bauer — Schlossmacher — 22).

No. 175. Yellow, very markedly rounded, irregularly developed crystal, bounded by hardly distinguishable 110 faces, with deep corrosion pits.
Inv. no. 8 size 4 mm.
FG — A 2
Luminescence: weak blue-green
(Pl. XXXVII. row 5)

No. 176. Yellow, very markedly rounded, irregularly developed crystal, bounded by unclear 110 faces.
Inv. no. 8 size 3.5 mm.
FG — A 2
Luminescence: weak blue-green
(Pl. XXXVII. row 5)

No. 177. Yellow, markedly rounded, very irregularly elongated 110, with corrosion pits.
Inv. no. 8 size 3 mm.
FG — A 2
Luminescence: weak blue-green
(Pl. XXXVII. row 4)

No. 178. Honey-coloured, markedly rounded, very irregularly developed 110, unclearly developed.
Inv. no. 8 size 4.5 mm.
FG — A 2
Luminescence: weak orange
(Pl. XXXVII. row 2)

No. 179. Honey-coloured, markedly rounded, somewhat irregularly developed 110, with small corrosion pits.
Inv. no. 8 size 3.5 mm.
FG — A 2
Luminescence: weak orange
(Pl. XXXVII. row 6)

All Australian diamonds (nos. 164—178) belong to the type 1. of diamonds of rhombododecahedric, ranging to octahedric habit and are in their morphology, colour and luminescence almost analogous to the Brazilian diamonds. Crystals bounded with 110 faces are here again completely predominant. Only a single one of the total of 16 crystals has predominating octahedric faces (no. 173). The Australian diamonds can be divided among the group 1a (colourless diamonds with blue luminescence) and among the group 1b (yellow diamonds with blue-green or orange luminescence).

Group 1a (nos. 164—174) represents the predominant type here as contrasted with the Brazilian localities. Among the specimens there are only luminescent diamonds; their intensity of luminescence is proportional to crystal transparency. No inactive diamonds were found. Thus we are dealing here with a complete analogy with the Rio Tejuco locality (nos. 57—61), or possibly with the first type of diamonds from the Wesselton Mine (nos. 2—18).

Yellow Australian diamonds of group 1b (nos. 173—178) can be—on the basis of their colour and luminescence quite clearly divided into pure yellow ones with a blue-green luminescence (nos. 175—177) and into honey-coloured ones with orange luminescence (nos. 178, 179). The former are quite analogous with the specimens nos. 93—101 from Brazil but there is no perfect analogy for the latter. It is of interest to compare them again with the morphologically completely different but analogous (in their luminescence) diamonds nos. 20—23 (cyclic spinel-law twins from the Wesselton Mine), no. 142 (the cubic-habit diamond from Brazil) and nos. 143—146 (spinel-law twin concretions from Brazil). All these diamonds have in common their honey-yellow to yellow-brown colour.

Australian diamonds of group 1a and 1b are both isometric and irregularly developed. There is again no difference in luminescence between the two types of crystal formation.

The percent distribution, however unsatisfactory it may be the low number of cases, is shown in the following Table.

Table 6

	Luminescence			
	blue	blue-green	orange	
1 a type	69 %			69 %
1 b type		19 %	12 %	31 %
	69 %	19 %	12 %	100 %

Summary of the results of observation of diamonds from the collections of the mineralogical department of the National Museum. It follows from Table 7 that there exist certain relationship between crystal morphology and colour of luminescence. In the left part of the Table there are diamonds from the individual localities divided into individual morphological types, in the right part the colour of their luminescence is given.

The diamonds are divided as follows:

1a) diamonds of octahedric to rhombododecahedric habit, colourless, white and bluish;

1b) diamonds of octahedric to rhombododecahedric habit, coloured;

2) diamonds of cubic habit;

3a) colourless twin concretions of diamond crystals according to the spinel law;

3b) coloured twin concretions of diamond crystals according to the spinel law;

3c) cyclic concretions of diamond crystals according to the spinel law;

4) concretions of two or more crystals without apparent regularity;

c) carbonados;

?) cut diamonds which are problematic to classify.

The following colours of luminescence have been observed: blue, blue-green, yellow-green, yellow, yellow-orange, orange, pink, anomalous (?) and inactive (0).

Observation results permit to draw the following conclusions which, however, after studying more material from the individual localities can be completed or possibly corrected:

1) Colourless, white and bluish diamonds of octahedric to rhombododecahedric habit from all localities have either a blue luminescence or are inactive. The relatively rare anomalies in diamond luminescence of this type are caused by zonality (2 cases), in other cases the luminescence is caused by surface impurities and thus not by true luminescence anomalies. The observation of blue luminescence with this type of diamonds is in general agreement with the data given by Soviet authors regarding diamonds from Siberian localities.

Table 7

Type									Locality	Luminescence								
1a	1b	2	3a	3b	3c	4	c	?		blue	blue-green	green-yellow	yellow	yellow-orange	orange	pink	?	0
	1								Dlažkovice					1				
17		1							Wesselton Mine	13							3	1
													1					
					4										4			
						2												2
16									Kimberley	9							1	6
			1															1
8									South Afrika	5							1	2
					1													1
	2								Lüderitz Bay	1			1					
	2								Kasai River							2		
1									Alaska									1
5									Rio Tejuco	3							1	1
							1		Minas Geraes									1
							1		Bahia									1
29									Brazil	27								2
	49										9	14	3			8		15
		1													1			2
				4											4			
			5							3								
						1												1
								11		10								1
11									Australie	11								
	5										3				2			
87	59	2	6	4	5	3	2	11		82	12	14	5	1	11	10	6	38

2) Coloured diamonnds of octahedric to rhombododecahedric habit usually display a coloured luminescence, more rarely are inactive (brown-red to yellow-brown diamonds) and in only one case (from Lüderitz Bay) a blue luminescence was observed. If the actual colour of this type of diamonds is compared with that of their luminescence the following relationships result:

a) golden-yellow diamonds (Lüderitz Bay) display a yellow-green or blue luminescence;
b) lemon-coloured diamond (Bohemia) has a yellow-orange luminescence;
c) honey-coloured diamonds (Australia) have an orange luminescence;
d) yellow diamonds from Belgian Kongo display a pink luminescence, those from Brazil a yellow-green, yellow, pink or inactive response, those from Australia luminesce with a blue-green colour;
e) yellow-brown to brown-red diamonds (Brazil) are inactive;
f) green to yellow-green diamonds (Brazil) have a blue-green to yellow-green luminescence;
g) pink diamonds (Brazil) have a pink luminescence.

3) Diamonds of cubic habit have probably a coloured luminescence. The yellow luminescence of the green-yellow diamond from the Wesselton Mine and the orange luminescence of the honey-coloured diamond from Brazil do not permit, however, to draw any definite conclusions.

4) Colourless twins of diamond crystals according to the spinel law have a blue luminescence and behave thus as the majority of colourless simple crystals.

5) Coloured twins of diamond crystals according to the spinel law have probably a coloured luminescence. An orange luminescence was observed with honey-coloured crystals of this type from Brazil. On account of the fact that only crystals from a single locality were available no definite conclusions may be drawn.

6) Cyclic twins of diamond crystals according to the spinel law probably have a coloured luminescence. An orange luminescence was observed with honey-coloured crystals of this type from the Wesselton Mine. On account of the fact that here also the specimens available originated from a single locality no definite conclusions can be made.

7) Groups of diamond crystals concresced without apparent regularity probably remain inactive in UV light.

8) Opaque crystals (e. g. bort, carbondo) are always inactive.

9) An irregular development of diamond crystals, be it in tabular or extremely elongated forms along one of the axes, is without effect on diamond luminescence. These crystals have an identical luminescence as those with a regular development.

10) Chaumet's view that the intensity of luminescence is proportional to the purity of diamond crystals has not a general validity. It seems that it is valid only for some localities (e. g. the Wesselton Mine) or for some types of diamond crystals from different localities.

Cut diamonds from the State Institute for Precious Metals.

It has been said above that there are relatively few publications presenting the colour of luminecence in relation to the number of stones examined. Besides, the data concerning the colour of luminescence are considerably incomplete and the majority of authors are satisfied with the statement that a given stone either has or has not a luminescence.

For the purpose of determining the probable distribution of luminescence colours the authors did not use the localized diamonds from the National Museum collections, as their number (178) did not appear sufficient. Therefore diamonds registered within a certain length of time by the State Institute for Precious Metals in Prague were used. As these were mostly stones of jewel or industrial types it was impossible to determine their locality or the original crystal habit.

A total of 6461 brilliant-cut diamonds, 1581 lozenge-cut diamonds and 729 industrial diamonds were measured. With the industrial stones and with the true luminescence colour with naked eye. Therefore a microscope was used in these disputable cases. Since most of these tiny stones formed a part of jewels and industrial tools, the intensity of blue luminescence was not distinguished with lozenges and industrial diamonds.

A general review of results obtained on measuring luminescence is given in Table 8.

Table 8

C	□		△		In	
	N	%	N	%	N	%
B+SB	1262	19,53	218	13,79	101	13,85
WB	1085	16,79				
GB	74	1,15	32	2,02	2	0,27
GY	74	1,15	21	1,33	1	0,14
Y	22	0,34	28	1,77	1	0,14
O	105	1,63	45	2,86	2	0,17
P	34	0,53	8	0,51	1	0,14
R	3	0,05	—	—	—	—
W	3	0,05	—	—	—	—
I	3799	58,78	1225	77,72	621	85,19
S	6461	100,00	1581	100,00	729	100,00

A review of the behaviour of cut diamonds in UV light.

B — blue
SB — marked blue
WB — weak blue
GB — blue-green
GY — yellow-green
Y — yellow
O — orange
P — pink

R — red
W — white
I — inactive
S — summary
C — colour of luminescence
□ — brilliants
△ — lozenges
In — industrial diamonds

N — number

In the course of the work also the relationship between the colour of luminescence and the size of the stone was determined. It was found that a higher colour diversity exists among smaller stones. The results are summarized in Tables 9 und 10.

Table 9

C	< 0,005		0,005—0,01		0,01—0,05		0,05—0,1		0,1—0,5		0,5—3,5		> 3,5	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
B+SB	164	15,07	284	16,74	590	22,49	80	16,77	118	26,16	23	18,17	3	50,00
WB	143	13,13	281	16,72	404	15,40	96	20,13	116	25,72	45	36,59	—	—
GB	13	1,19	16	0,95	38	1,45	2	0,42	3	0,67	2	1,63	—	—
GY	13	1,19	10	0,59	31	1,18	4	0,84	13	2,88	3	2,44	—	—
Y	1	0,09	6	0,36	14	0,53	1	0,21	—	—	—	—	—	—
O	23	2,11	23	1,38	33	1,26	7	1,46	13	2,88	6	4,87	—	—
P	6	0,55	13	0,76	12	0,46	—	—	3	0,67	—	—	—	—
R	—	—	1	0,06	1	0,04	1	0,21	—	—	—	—	—	—
W	—	—	1	0,06	2	0,08	—	—	—	—	—	—	—	—
I	726	66,67	1057	62,48	1498	57,11	286	59,96	185	41,02	44	35,77	2	50,00
S	1089	100,00	1692	100,90	2623	100,00	477	100,00	451	100,00	123	100,00	6	100,00

A review of the behaviour of diamonds of brilliant cut in UV light with regard to their size.

Abbreviations used, as in Table 8. Weight in carats.

Table 10

C	< 0,005		0,005—0,01		0,01—0,05		0,05—0,6	
	N	%	N	%	N	%	N	%
B+SB+WB	120	12,70	110	14,25	84	14,66	5	25,00
GB	17	1,80	3	0,38	14	2,44	—	—
GY	12	1,27	2	0,26	5	0,87	3	15,00
Y	15	1,59	1	0,13	13	2,27	—	—
O	28	2,96	1	0,13	18	3,14	—	—
P	2	0,21	1	0,13	6	1,05	—	—
I	751	79,47	654	84,71	433	75,57	12	60,00
S	945	100,00	772	100,00	573	100,00	20	100,00

A review of the behaviour of diamonds of lozenge cut and of industrial quality in UV light with regard to their size.

Abbreviations used as in Tables 8 and 9. Weights of stones in carats.

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EXPLANATIONS OF THE TABLES.

Pl. XXXI.

Fig. 1. The spectral analysis of the light of a mercury discharge tube Elmed Lumina — U with a dark blue filter.

Fig. 2. The spectral analysis of the light of UV — lamp with Wood's filter.

Pl. XXXII.

Diamond crystal from the diamond fields of Southern Africa intergrown with kimberlite.

Pl. XXXIII.

Unique diamond crystal from Kimberley intergrown with kimberlite.

Pl. XXXIV.

Row 1: diamonds nos. 1 (Dlažkovice), 28 and 32 (Kimberley), row 2: diamonds nos. 42 (Kimberley), 52 and 53 (Lüderitz Bay), row 3: diamonds nos. 54 and 55 (Kasai River), 63 (Bahia), row 4: diamonds nos. 65, 77 and 78 (Brazil).

Pl. XXXV.

Diamond (bort) from Minas Geraes intergrown with diamond-bearing conglomerate (cascalho).

Pl. XXXVI.

Diamond crystals from the diamond fields of Brazil. (Foto dr. A. Pilát) Row 1: diamonds nos. 75, 111, 94 and 76, row 2: diamonds nos. 95, 103, 79 and 98, row 3: diamonds nos. 99, 137, 97 and 100, row 4: diamonds nos. 102, 138, 139 and 112, row 5: diamonds nos. 113, 80 and 136.

Pl. XXXVII.

Diamonds crystals from the diamond fields of Australia. (Foto dr. A. Pilát). Row 1: diamonds nos. 165, 166 and 164, row 2: diamonds nos. 178, 169 and 168, row 3: diamonds nos. 167, 174 and 170, row 4: diamonds nos. 172, 177 and 171, row 5: diamonds nos. 175, 173 and 176, row 6: diamond no. 179.

Pl. XXXVIII.—XL.

The photographies of lozegne-cut diamonds of various colour of luminescence at different exposures similarly as Raman (5) describes. The photographies were taken with camera Contaflex, negative material Foma 21/10 Din, in UV-light a filter with a film of gelatine impregnated with alcohole solution of esculine was used.

Fig. 1. The photography in day light. Irris 11, exp. $1/5$ sec.
Fig. 2. The photography in UV light. Irris 11, exp. $1/5$ sec.
Fig. 3. The photography in UV light. Irris 11, exp. $1/2$ sec.
Fig. 4. The photography in UV light. Irris 11, exp. 1 sec.
Fig. 5. The photography in UV light. Irris 11, exp. 5 sec.
Fig. 6. The photography in UV light. Irris 11, exp. 10 sec.