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## COBALT IN KIMBERLITES

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Nickel has been reported as a constituent of Jagersfontein kimberlite in quantities from 0.08 to 0.14%, and as a component of nodules of eclogite, pyroxenite, phlogopite, and chrome diopside found in kimberlites, in amounts from a trace to 0.26% (4). We have not, however, been able to find a reference to cobalt in kimberlite or its associated minerals.

In the course of complete chemical analyses of the ten different types of kimberlite found in Premier Mine, Transvaal, South Africa, we have found cobalt ranging from 0.003 to 0.008%. Cobalt was determined by the accurate and convenient colorimetric procedure using nitroso-R-salt (5). The results for cobalt, together with those for iron and nickel, are given in Table 1.

Some investigators have seen an analogy between the forces of tem-

Table 1. Content of Cobalt, Iron, and Nickel in Premier Mine Kimberlites

| *Kimberlite Type* | *Percentage* | | |
|---|---|---|---|
| | Co | Fe | Ni |
| 1 | 0.005 | 5.86 | 0.10 |
| 2 | 0.003 | 5.41 | 0.11 |
| 3 | 0.007 | 7.32 | 0.11 |
| 4 | 0.006 | 6.36 | 0.12 |
| 5 | 0.007 | 6.90 | 0.13 |
| 6 | 0.006 | 8.73 | 0.10 |
| 7 | 0.006 | 7.00 | 0.09 |
| 8 | 0.008 | 7.35 | 0.11 |
| 9 | 0.005 | 9.35 | 0.15 |
| 10 | 0.006 | 7.05 | 0.11 |

perature and pressure acting on kimberlite which result in the crystallization of carbon, and the forces operating in the formation of meteorites. Graphite is present in both kimberlites and meteorites, and some of the latter are largely made up of minerals like enstatite and olivine which occur commonly in kimberlite. It is therefore interesting to compare the ratios of iron, nickel, and cobalt in kimberlites with those in meteorites. Since the different types of kimberlite found in Premier Mine are representative of the varieties of this mineral found in other parts of the world, we believe our results are of general application.

The ratio of nickel to cobalt in meteorites has been given by Rankama and Sahama (2) as about 8, and approximately the same ratio has been reported by Beck and La Paz (1) for the stony phase of nortonite, the largest meteorite of any type of witnessed fall. The latter workers reported for the metallic phase of this meteorite a nickel:cobalt ratio of 16, while in the metallic phases of other meteorites this ratio has varied from 5 to 20 (3).

The iron:nickel ratio in both the metallic and the stony phases of other analyzed meteorites gave iron:nickel ratios varying from 2 to 25 (1), while in metallic phases similar ratios have been reported from 17 to 26.

In kimberlites the ratio of nickel to cobalt varies from 14 to 38, with an average of 21, while the iron:nickel ratio ranges from 49 to 87, averaging 64. The nickel:cobalt and iron:nickel ratios in kimberlites are therefore higher than in meteorites. The solubility of carbon in molten metals of the iron group is highest in iron, followed by nickel and then cobalt. On this basis and under the same conditions, it would appear that kimberlite might be a more favorable medium for diamond formation than a meteorite.

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