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abstracts

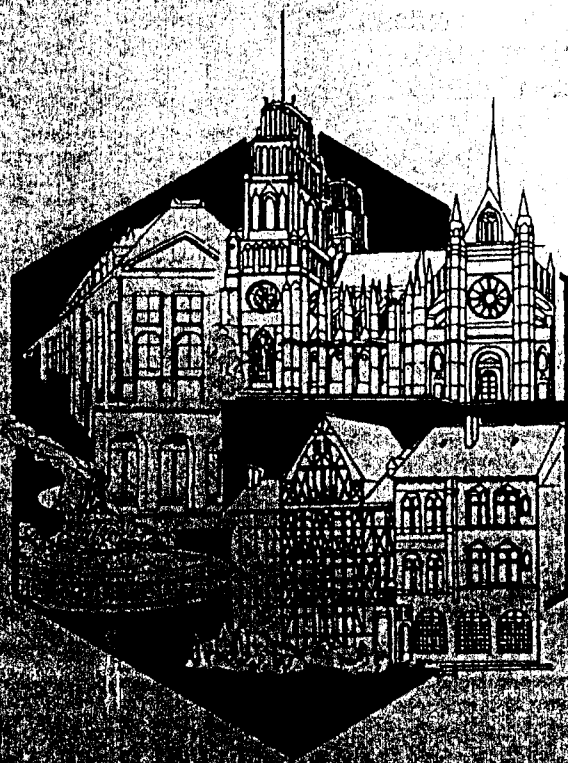
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various age. The conclusion was done about polygenic nature of formation of platinum mineralization of chromitites. Identity in mineral composition and geochemical peculiarities of PGM from placers and chromitites determine the latter as the main source of platinum - bearing placers associated with such type intrusives.

Keywords platinum mineralization
chromitite intrusive

04 GEOLOGICAL CHARACTERISTICS OF ALKALINE ROCKS AND CARBONATITES OF FUERTEVENTURA (CANARY ISLANDS, SPAIN) AND THEIR REE ORE POTENTIAL

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Alkaline intrusive complexes at Fuerteventura have been explored for potential production of REE. Two main complexes are present: the Puerto de la Peña-Cueva de Lobos - PP-Cl - (=60 Ma) in the western centerpoint of the island and the Esquinzo - E - (=30 Ma) in the northern zone. These complexes are composed of ultramafic to salic rocks and carbonatites. Syenite-ijolite-carbonatite rocks show up as radiometric anomalies (50-820 c/s) and contain relatively high REE concentrations (Σ REE in ppm 50-7,372).

The calciocarbonatites (sövites and alwikites) formed in the last phases of the complexes show the highest values of REE (511-7,372 ppm) and these elements are associated with carbonates (synchisite), phosphates (apatite), silicates (allanite) and oxides (perovskite). These rocks appear as veins and breccias of metric and centimetric sizes distributed at random (Barrancos de Agua Salada and Encantados in E complex, and Punta de Nao in the PP-CL complex), and as migmatitic textures bands (Caleta de la Cruz and Peñón Blanco in the PP-CL complex), striking N 20-50 E and dipping subvertically, all of them crossed by a swarm of later dykes. The $\delta^{18}\text{O}_{\text{SMOW}}$ values of the carbonatites vary from 6.6 to 11 per mil and $\delta^{13}\text{C}_{\text{PDB}}$ values vary from -4.8 to -6.5 per mil, and demonstrate that they have mantle origin. Except for Cape Verde Islands, Fuerteventura is the only other known ocean island with subaerially-exposed carbonatites but they have not economic interest due to the small volumen of carbonatite outcrops and these show minerals relatively rich in mixed light REE.

Keywords alkaline rocks carbonatites
REE geological exploration

105 METASOMATIC DEPLETION OF Ni-Cu-Fe SULPHIDES, VAMMALA MINE, FINLAND

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Migmatite-derived granitic leucosome intruded a 1.89 Ga Ni-Cu-Fe sulphide-bearing peridotite sheet. Zones of amphibole-phlogopite after peridotite, separate the leucosome from now-serpentinized peridotite. The zones' mineralogy suggests at least 600°C and 4.5 kb. At much lower temperature and pressure, hydration of the peridotite serpentinized the olivine. Direct investigation of the peridotite-to-zone transition is therefore precluded.

Three methods are used to document the behaviour of the serpentinized peridotite-to-zone apparent transition, and hence infer the mass-balance trends of the real peridotite-to-zone transition. The methods collectively suggest that K_2O , Rb_2O , P_2O_5 , TiO_2 and Al_2O_3 form a group of relatively enriched components and that Al_2O_3 was particularly mobile. An estimated volume increase of 10-20% accompanied serpentinization, and a calculated volume decrease of 10-15% accompanied the apparent transition; a volume increase of < 5% was therefore involved in the real transition. Gresens' equation demonstrates that the apparent transition involved mass-gains in SiO_2 , Al_2O_3 , K_2O , P_2O_5 and TiO_2 , and mass-losses in FeO, MgO, CaO, Ni, Cu, S and LOI, this amounting to net losses of 32.5 kg of LOI and 10.8 kg of other components per 1000 kg of serpentinized peridotite. The real transition involved similar relative gains and losses, except for SiO_2 -gain (slightly less), MgO-loss (slightly more) and LOI-loss (negligible). It records inward transfer of components from a feldspar-rich source to the peridotite, and outward transfer to that source; it is consistent with metasomatic exchange between peridotite, and supra-solidus (?) leucosome.

Ni-Cu-Fe sulphides were retained and redistributed (internally remobilized) in zones 1 to 3, but transferred into the dyke from zone 4 (externally remobilized). This metasomatic depletion negligibly affects in situ grade at slope-scale. Conversely, the mechanical weakness of the dyke and alteration systems adversely effects mining costs and head grade.

The same genetic and economic interpretations probably apply to similar dyke and alteration systems in other ultramafite-hosted Ni-Cu-Fe sulphide deposits in southwest Finland.

Keywords metasomatism nickel sulphide
peridotite remobilization

106 MAGMATIC METASOMATISM IN THE ATOK SECTION OF THE MERENSKY REEF, BUSHVELD COMPLEX, AND ITS BEARING ON ORE FORMATION

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A detailed study of the Merensky reef (MR) and associated rocks at Atok, northeast Bushveld Complex (BC), indicates that magmatic metasomatism was important in the petrologic and geochemical evolution of the rocks. Unlike the MR in the western BC, the MR at Atok is encased in a modally and compositionally homogeneous cumulate pyroxenite. The MR consists of two chromitite seams separated by \approx 50 cm of pyroxenite. The basal chromitite caps a laterally continuous pegmatoid. Ion probe analyses of cpx and opx from the MR and pegmatoid are enriched in REEs by factors of \approx 4 to 10 compared to cumulus pyroxene in underlying and overlying norite. The melt with which MR px equilibrated possessed LREE abundance of \approx 300 to 900 and HREE abundances of 25 to 40 times chondrites, which are far in excess of the REE contents of most basalts. In contrast, the compositions of cumulus px from several meters below the MR indicate crystallization from a magma which had REE contents more typical of basaltic magma. The MR px are not evolved in terms of major element contents. The divergence of major and incompatible trace element contents cannot be due to closed system crystallization but is the expected consequence of metasomatism. In this case, the process involved reaction of a pre-existing cumulate assemblage with melt percolating through the crystal mush.

The sulfides were enriched in the protoreef because of minor perturbations in the fO₂/fS₂ at the metasomatic front, where chromite was also stabilized. The PGE content of the MR is fundamentally controlled by sulfide melt-silicate melt partitioning, but the necessarily high R-factor was achieved by the fact that large masses of melt either percolated through the sulfide protoreef or that the sulfide-bearing front swept through large mass of partially molten rock.

Keywords Bushveld pyroxene rare earth elements sulfides