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PODIFORM CHROMITE ORE BODIES : A MODEL OF MAGMA FLOW THROUGH DIKES AND CAVITIES

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Podiform chromites ores are found in ophiolite complexes which are supposed to be formed under oceanic ridge. The ore cristallises and accumulates from silicate magma flowing through dykes. Field data support the fact that the accumulation of chromium was set in cavities 5m thick and hundred meters high somewhat larger than the usual thickness of dykes (0.10 - 1m large). The thermal contrast between the magma and the peridotite walls generates in these cavities a strong convective circulation.

Numerical models of the flow accross the feeding dyke and cavity are presented. The needed physical conditions necessary for the formation of the ore are presented. They put constrains on the thickness, flow intensity, spatial and temporal activity of these dykes. They are compared with these drawed from other geophysical and geological studies, and give thus some light on the possible processes acting under the magma chambers in oceanic ridge environment.

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HIGH TEMPERATURE DIKES IN MANTLE PERIDOTITES : ORIGIN BY HYDRAULIC FRACTURING DURING PLASTIC FLOW

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The orientation of high temperature dikes has been studied with respect to the plastic flow foliation and lineation in peridotites from several massifs and from basalt xenoliths. Layering and dikes are composed of various types of pyroxenites and gabbros ; dunites, thought to represent residuae along high temperature dikes, have been also studied.Layering is composed of dunites, websterites and/or orthopyroxenites, usually with the same minerals as in the host peridotite. The same rock types can be observed in the dikes emplaced early during plastic deformation but the sequence tends to evolve towards more ariegitic or gabbroic facies.

Dikes emplaced during plastic flow display two dominant preferred orientations, one is at high angle to the stretching lineation, the other is parallel to the shear planes deduced from the flow regime analysis in the peridotite (a unique shear plane oblique to the foliation in the case of rotational flow, two shear planes conjugate with respect to the foliation in the case of irrotational flow). Fracturing in all these orientations is ascribed to the magma pressure created by partial melting. Comparatively low magma pressure and high applied deviatoric stress result in shear fractures ; high magma pressure and moderate applied stress result in tension fractures (at high angles to the lineation). Dikes emplaced before or early during plastic flow are strongly deformed and tectonically rotated towards the foliation and lineation directions. For a large deformation they become parallel to the foliation orientation. The ubiquitous layering of mantle peridotites can originate in this way.