The Plio-Quaternary nephelinitic and basanitic volcanoes of the Tahalra area (Hoggar, south Algeria) contain numerous upper mantle xenoliths and xenocrysts (sp. lherzolite, pyroxenes and/or amphiboles rich inclusions, kaersutite and ferrisalite megacrysts). Mg-ilmenite have been observed with a distinct habit in two types of rocks :

* Large polycristalline xenoliths (3-20 cm) which contain only Mg-ilmenite grains (0,03 to 15 mm) with exsolution of titanomagnetite and Al-spinel. These xenoliths exhibit tectonic fabrics which can be ascribed to solid state flow followed by dynamic recrystallisation. Their rounded surfaces display cavities filled up with kaersutite, fassaïte and olivine. These Mg-ilmenite xenoliths have the same chemistry (25 to 37 % mol. of geikielite) and the same texture as the Mg-ilmenites found in kimberlites (a lack of outward Mg enrichment is the only difference) (1).

* Lherzite xenoliths in which interstitial undeformed Mg-ilmenite crystals (<2 mm) of identical composition are associated with kaersutite (± olivine and fassaïte). From the study of a composite lherzite-sp. lherzolite xenolith, these nodules of Mg-ilmenite-lherzite are thought to be pieces of veins which may occur in the upper mantle lherzolites.

Textural relationships and chemical compositions suggest a similar origin for these two types of Mg-ilmenite. In both cases, they crystallised from a liquid of high-Ti nephelinitic composition in the upper mantle conditions. Ascending later magmas sampled both deformed and undeformed Mg-ilmenite xenoliths suggesting either several generations or different tectonic evolutions for the upper-mantle Mg-ilmenites.

(1) Contrib. Mineral. and Petrol.

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RELATIONSHIP BETWEEN GEOCHEMISTRY AND COLOR OF GARNET XENOCRYSTS FROM COLORADO-WYOMING KIMBERLITES

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Color of garnet grains obtained by alluvial and(or) soil sampling programs may be a useful indication of the presence of kimberlite in a prospecting target area. Garnet xenocrysts from 12 kimberlites in northern Colorado and southern Wyoming were classified according to color and chemistry in order to ascertain their petrologic parentage and test the viability of using grain color as a means of rapid identification of kimberlite indicator garnets. Seventeen color groupings were established with the aid of a G.S.A. Rock Color Chart, and grouped into four major color categories: Group 5R (red garnets), Group 5RP (red purple garnets), Group 10R (reddish-orange to reddish-brown garnets), Group 5YR (brown garnets). Representative samples of each color grouping have been analysed by electron microprobe, and data for 91 garnets reveals distinct chemical trends between the major color categories. In general, CaO and Cr_2O_3 increase whereas Al_2O_3 decreases in order of Groups 5YR, 10R, 5R, and 5RP, FeO increases in order of groups 5R, 5RP, 10R, and 5YR, and TiO_2 increases in order of Groups 5YR, 5R, 5RP, and 10R. Groups 5R and 5RP have the highest Cr/Al and lowest TiO_2, a "depleted" chemistry typical of rounded pyrope xenocrysts in kimberlite, Cr-rich garnet megacrysts, and peridotite garnets. Groups 10R and 5YR have lower Cr/Al and higher TiO_2 and FeO, values that are characteristic of garnets from websterites, pyroxenites, eclogites, and granulites. Some Group 10R garnets have compositions similar to Cr-poor garnet megacrysts. (Study supported by Earth Sciences Section of NSF, Contract EAR-7810775)

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THE SIGNIFICANCE OF SULFIDES IN SPINEL AND GARNET LHERZOLITES AS CARRIERS OF PLATINUM METALS

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Ultramafic nodules from alkali basalts and kimberlites are a major source for estimating the chemical composition of the upper mantle. Concentrations of major elements and a large number of trace elements are surprisingly uniform in primitive nodules (1). Abundances of Ir and other noble metals also show little variations in spinel lherzolites. However the content of,for example Ir in these upper mantle samples is much higher than that expected from core mantle equilibrium. Since the relative abundances of Ir, Au etc. in these samples are the same as those of undifferentiated meteorites, it was suggested that these elements are derived from a late meteoritic component at a time when the core had already formed (1, 2, 3). This hypothesis has been recently questioned by Mitchell and Keays (4). These authors argued that the siderophile elements in mantle samples are the result of immiscible sulfide liquids, separated from basaltic liquids formed by partial melting of the mantle. Part of the evidence provided by Mitchell and Keays was the fact that only minor fractions of Ir, Au etc. are contained in the major minerals of upper mantle samples, and that therefore sulfides are the most likely host phases for these elements.

We have separated and analyses sulfides from spinel and garnet lherzolites. Preliminary results have been reported (1). Two main questions will be addressed in this investigation:

a.) Are sulfides the major host phase of noble metals in upper mantle samples?

b.) What is the origin of these sulfides? Were the noble metals originally contained in other phases and did they partition into later formed sulfides?

We are planning to analyse these sulfides for lead isotopes, in order shed light on their origin.

Lit.: (1) Jagoutz, E.et al.Proc.10th Lunar Planet. Sci.Conf.p.2031 (1979);(2) Chou,C.L.Proc.9th Lunar Planet.Sci.Conf.p.219 (1978);(3) Morgan,J.W.et al Tectonophysics 75,p.47 (1981);(4) Mitchell,R.H.& Keays,R.R.Geochim.Cosmochim.Acta 45,p.2425 (1981).

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OPAQUE MINERALOGY AND CHEMISTRY OF ILMENITE NODULES IN WEST AFRICA KIMBERLITES: SUBSOLIDUS EQUILIBRATION AND CONTROLS ON CRYSTALLIZATION TRENDS

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A regional survey of kimberlitic heavy mineral concentrates from Liberia (2 pipes and 13 probable dikes), Sierra Leone (3 pipes and 5 dikes), Guinea (3 pipes) and Mali (3 pipes and 1 dike)