

roxene grains + minor ilmenite. The same experiment involving a concentrated NaCl brine (20-30% H₂O; 80-70% NaCl) resulted in veins approximating a granitic composition along quartz/plagioclase grain boundaries with numerous small orthopyroxene grains + minor ilmenite volunteering along biotite grain boundaries, again only when the biotite and quartz were in contact.

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HYDROTHERMAL SYNTHESIS OF ALLUAUDITE IN THE Na-Mn-Fe²⁺-Fe³⁺-P-O SYSTEM

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Alluaudite, a Na-Mn-Fe-bearing phosphate mineral, is known to occur in Li-rich granitic pegmatites. During the past decade, several compounds with the alluaudite structure were synthesized, but their stability was scarcely envisaged. This is the reason why we decided to investigate the Na-Mn-Fe²⁺-Fe³⁺-P-O system.

Starting from compositions ranging from Na₂Mn₂Fe³⁺(PO₄)₃ to Na₂Fe²⁺₂Fe³⁺(PO₄)₃, the hydrothermal syntheses were carried out between 300 to 800°C and 0.1 to 0.5 GPa, using horizontally arranged Tuttle-type cold-seal bombs. Pure alluaudite is obtained between 300 and 400°C, whereas alluaudite is associated with maricite, Na(Fe²⁺,Mn)PO₄, between 600 and 800°C. Maricite exhibits a crystal structure different from that of natrophilite, NaMnPO₄, which is isotypic with olivine (Le Page & Donnay, 1977; Moore, 1972). Surprisingly, as far as we know, maricite has never been observed in granitic pegmatites.

Between 700 and 800°C, alluaudite and maricite are associated with fillowite and/or with an undetermined phase. This phase could correspond to an orthorhombic polymorph of the arrojadite structure (Moore et al., 1981), with $a = 25.892(4)$, $b = 14.792(5)$, and $c = 10.364(2)$ Å, space group *Pnma*. A single crystal with a chemical composition close to NaMn₄(PO₄)₃, recently investigated by Keller et al. (2001), has shown a crystal structure corresponding to that of fillowite (Araki & Moore, 1981).

From the electron microprobe analytical results on the alluaudite crystals, the presence of both Fe²⁺ and Fe³⁺ in the structure can be deduced, in agreement with the chemical data on natural samples. Compared with the starting compositions, the alluaudite solid solutions are also enriched in bivalent cations and depleted in Na and Fe³⁺, according to the substitution mechanism Na⁺ + Fe³⁺ = (Fe²⁺,Mn²⁺) + Fe²⁺. Additionally, the morphology of the alluaudite crystals shows significant variations with the experimental conditions.

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INTERACTION OF HYDROUS GRANITIC MELTS WITH CARBONATES: IMPLICATIONS FOR DEVOLATILISATION IN SUBDUCTION ZONES

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Interlayered pelites and carbonates are common in subducted oceanic sediments. The interaction of hydrous granitic melts produced in deeply subducted metapelites with carbonates has been investigated by piston cylinder sandwich experiments. At 1000°C, 4.5 GPa the paragenesis in a synthetic simplified pelite composition (KCMASH) containing 2.5 wt.% H₂O consists of phengite + garnet + clinopyroxene + kyanite + coesite + hydrous granitic melt. Dolomite embedded in the pelite reacts with the hydrous granitic melt and produces the paragenesis garnet + clinopyroxene + dolomite + liquid. Qualitative mass-balance constrains this liquid composition to 60 wt.% CO₂, about 10 wt.% of each of H₂O, K₂O and CaO and very small amounts of SiO₂, MgO and Al₂O₃. This liquid therefore reflects rather a carbonatite melt than a water-rich CO₂-H₂O fluid. In the pelite adjacent to the dolomite layer, an increasing abundance of garnet, kyanite and melt and a decreasing amount of clinopyroxene, phengite and coesite has been observed. This suggests that the presence of carbonate enhances melt production in the pelite. No clear separation between the hydrous granitic melt and the "carbonatite-like" liquid has been observed indicating complete miscibility. Carbonate solubility in hydrous granitic melts has been further investigated in the range 3.5-4.5 GPa and 900-1000°C by mixing a pelite with different amounts of dolomite and calcite. The runs contain hydrous granitic melts coexisting with garnet, coesite, omphacite, carbonate and occasionally phengite and kyanite. Mass balance reveals that about 1.5-2 times more CO₂ than H₂O is dissolved in the melt. We therefore propose that hydrous granitic melts are capable of transferring not only H₂O but also significant amounts of CO₂ from subducted sediments to the mantle wedge. The physical properties, the ability to transport trace elements and the interaction with the mantle wedge of such melts are yet to be determined.

STATIC COMPRESSION OF IRON SILICIDES TO MEGABAR PRESSURE

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Seismic data indicates those both inner and outer cores are less dense than pure iron at core pressures and temperatures. This suggests that light elements as iron compounds are contained in the inner and outer core. The preferred candidates for the light element are sulfur, oxygen, carbon, silicon, and hydrogen. Because silicon is one of the most abundant elements in the Earth, silicon could contribute to the density deficit. However, there are little experimental data at the core pressures on the properties of iron-silicon alloys. We have investigated the in-situ high-pressure behavior of iron silicides, Fe with 17 wt.% Si