Trace element-enriched fluids released during slab dehydration: implications for oceanic slab - mantle wedge transfer.

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Mafic blueschists of the Tianshan (NW China) display an interconnected network of eclogite-facies veins derived by prograde blueschist dehydration. The eclogite-facies vein-network in the Tianshan blueschist was found to be the product of hydrofracturing induced by fluids released by the breakdown of glaucophane, paragonite and epidote minerals during blueschist-eclogite transition and, thus represent former fluid pathways within a Paleozoic subduction zone. The veins are predominantly composed of omphacite fibers with minor quartz, calcite, and apatite. The transition from blueschist- to eclogite-facies parageneses occurs as "dehydration" halos along some of these veins. The fluids are interpreted to have been derived from the host blueschist as a result of dehydration reactions at peak metamorphic conditions of 480-600°C and 18-21 kbar [1, 2]. The low in trace element fluid caused a strong mobilization of LILE, REE, and high field strength elements (HFSE) in those parts of the host rock with which the passing fluid reacted [2]. Hence indicating that so-called immobile elements can be mobilized by reactive flow. Furthermore, field evidence shows that rutile occurs in the form of needle-like segregations in an eclogite boudin and as prismatic crystals in an omphacite-bearing vein cross-cutting foliated host eclogites. Textural and geochemical studies indicate that titanium, niobium and tantalum can be mobilized and transported by fluids which were liberated by means of dehydration of the subduction oceanic crust. Vein-rutile precipitation occurred at sites where evidence for an increasing oxygen fugacity in the acting fluid is found, causing a sudden depletion of the HFSE concentration in the fluid. Such a fluid may act as agent for the subduction component seen in the distinct chemistry of normal island-arc magmas.

References

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