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Interaction of mineral Inclusions, Melt and Garnet host under ultrahigh pressure Conditions

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Mineral inclusions in garnet are usually considered to be relict testimony of earlier metamorphic history, and thus play a key role in deciphering the pressure – temperature evolution of rocks. An experimental study on eclogitic garnets with different mineral inclusions (including hydrous phases and carbonates) from several subduction-related complexes reveals considerable modification of garnet interiors at temperatures (T) of 800 – 1100˚C and a pressure (P) of 4 GPa, representative of different diamond-bearing metamorphic UHP terranes. The experiments reveal that fluids liberated by the breakdown of hydrous mineral inclusions control the development of melt pockets and typical patchy microstructures of garnet. The composition and extent of the development of new garnet and melt (either silicate or carbonate-silicate) strongly depends on the P-T conditions of the run and the types of mineral inclusions involved. The transformation of mineral inclusions and the modification of garnet host chemistry obliterate the record of earlier stages of metamorphic history. Patchy microstructures, as observed in the newly formed garnets, are proof of melt involvement in our experiments and may also point to similar processes in natural garnet-bearing UHP metamorphic rocks. Such recrystallization of garnet interiors controlled by internally produced fluids has important consequences for thermobarometry, fluid-inclusion studies and for the rheology of (U)HP rocks.