

Ultra-high pressure metamorphism in western Tianshan, China: Part II. Evidence from magnesite in eclogite

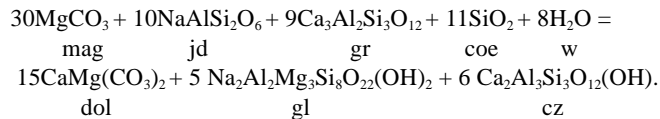
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ABSTRACT

Carbonates of ultrahigh-pressure metamorphic (UHPM) origin were discovered in eclogites from western Tianshan, China. In the eclogites, relict magnesite ($X_{\text{Mg}} = 0.79$) occurs as rounded to subidiomorphic inclusions (0.01–0.1 mm) within matrix dolomite, and also as rounded inclusions with thin reaction rims of dolomite in glaucophane. Based on the textural evidence and calculated phase relationship, these eclogites record an early UHPM assemblage overprinted by a blueschist assemblage, which can be explained by the reaction:



Using THERMOCALC (v2.75) and the updated internally consistent mineral thermodynamic database of Holland and Powell (1998), we have calculated the P - T grid involving glaucophane (gl), grossular (gr), jadeite (jd), magnesite (mag), dolomite (dol), clinozoisite (cz), coesite (coe), CO_2 , and H_2O in a 7-component system of NCMASCH (Na_2O - CaO - MgO - Al_2O_3 - SiO_2 - CO_2 - H_2O). The calculated P - T slope of the above reaction is nearly parallel to the temperature axis and suggests that it can be used as an excellent geobarometer. Using the analyzed compositions and mineral-thermodynamic database of Holland and Powell (1998), the above retrograde metamorphic reaction in Tianshan eclogites occurred at 27–28 kbar and 525–607 °C calculated from Grt-Cpx geothermometers.