UHP METAMORPHISM - PROSPECTING FOR POTENTIAL COESITE-BEARING TERRANES WITH ALTERNATIVE GEOTHERMOBAROMETRIC METHODS

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Numerous metamorphic belts around the world have now been identified as containing coesite-bearing rocks and thus fitting the minimum criterium for ultrahigh pressure (UHP) metamorphism. In some of these areas, such as the Western Gneiss Region of Norway, estimates of formation pressures of ca. 15 kbar had already been made on samples that were later found to contain coesite. The reason for this discrepancy is that P-T estimates were derived solely from Grt-Cpx geothermometry and Ab-Jd-Qz geobarometry (minimum P in the absence of plagioclase). Better thermodynamic datasets and improved activity-composition data now allow definition of considerably more reliable reactions for the determination of P-T in HP and UHP rocks. The intersection of fluid-bearing reactions such as: Pg = Jd+Ky+water, Zo = Grs+Ky+Qz+water and Grs+Rt+Qz+water=Zo+Ttn or the fluid-independent reaction Prp+Grs=Di+inverse Tschermaks in phengite have all been used to confirm pressures much higher than the traditional minima and also, in some cases, consistent with the presence of coesite or diamond. On the basis of these alternative methods, locations such as the Urals (Russia) and Münchberg Massif (Germany), where the former presence of coesite was suspected due to the finding of radial cracks around quartz inclusions in eclogite garnets, do not yield coesite-field pressures. However, reworking of mineral composition data from phengite-bearing eclogites from the Himalaya (Kaghan Valley, Pakistan, and Ladakh, India) resulted in pressure estimates falling in the coesite stability field: a fact subsequently confirmed by the finding of coesite relics in a Kaghan Valley eclogite.