Origin of talc deposits in the Góry Sowie Massif (SW Poland)

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Serpentinite bodies embedded into migmatic gneisses of the Góry Sowie Massif (Central Sudetes, SW Poland) host several talc deposits. Samples from the talc deposit near Gilów, which was quarried in the past, were subjected to detailed study. Bulk chemical analyses, stable O and Cl isotope ratios measurements, and electron microprobe U-Th-Pb chemical dating were performed in order to recognize the formation mechanism of talc deposits.

A monazite U-Th-Pb age of ca. 386 Ma links the talc formation with a major tectonothermal event in the Góry Sowie Massif, responsible for the country gneisses migmatization, as well as intrusions of pegmatites and hornblendites ([1,2,3] and references therein). High bulk Cr (2121-2148 ppm) and Ni (1079-1561 ppm) contents of talc rocks implies that talc was formed at the expense of serpentinites (2272-2292 ppm Cr, 1682-1891 ppm Ni), whereas slightly elevated $\delta^{18}O$ value of talc ($\delta^{18}O$ = +8.3‰) relative to adjacent serpentinites ($\delta^{18}O$ value +5.7 to +7.1‰) suggests interaction with crustal-derived fluids. A scattered chlorine isotope composition of talcose rocks ($\delta^{37}Cl$ value -1.2 to -0.1‰) suggests that crustal fluids originated from country migmatic gneisses ($\delta^{37}Cl$ = -1.0‰ to +0.1‰) or intrusions of the Góry Sowie pegmatites ($\delta^{37}Cl$ = 0.0‰).

Summing up, talc deposits in the vicinity of Gilów were formed at the expense of serpentinized peridotites, after their emplacement into the crustal rocks. Talc formation was likely contemporaneous with the major tectonothermal episode in the Góry Sowie Massif and was caused by fluids derived from anatecting gneisses and intruding pegmatites.

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