Tourmaline breakdown in high-grade metamorphic rocks from the Alamo Complex (Central Iberian Zone, Spain): Implications for evolution of boron during crustal anatexis

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The Alamo Complex comprises a set of structural-metamorphic domes alternating with low-grade metasedimetary rocks of Upper Proterozoic to Lower Cambrian age in the northern part of the Schist-Greywacke Complex (Central Iberian Zone). Tourmaline is a widespread mineral within the domes, which occurs in clastic metasedimentary rocks, tourmalinites, gneisses, migmatites, leucogranites and pegmatites. Tourmaline composition from metamorphic rocks, with Mg/(Mg+Fe) = 0.35-0.73 and X/(X+Na) = 0.10-0.56 (X = X-site vacancy), as well as the bulk-rock B contents (generally < 100 ppm) do not show systematic variations with increasing metamorphic grade. Large tourmaline crystals occur in the transition from biotite-cordierite-sillimanite-plagioclase gneisses to migmatites. Generally tourmaline is scarce or absent in stromatic migmatites. It appears as subhedral crystals in leucosome layers associated with quartz, plagioclase and biotite. Textural evidence for breakdown of tourmaline is provided by the occurrence of crystals in melanosome domains displaying corroded edges and deep embayments. Boron liberated by destabilization of tourmaline would incorporate into associated melts and fluids and play a significant role in controlling the behaviour of boron during anatexis. Tourmaline-bearing leucogranite sheets and dikes can be found within the migmatite zone, suggesting a genetic relationship between leucogranites and migmatites. The high B contents of the leucogranites (up to 1.2% B_2O_3), in conjunction with the low B contents of the migmatites, suggest that anatexis was an open system process with significant circulation of B-rich fluids. These may have important implications on the melt generation and rheology of the rocks. The activity of B-rich fluids during metamorphism, anatexis and segregation of granitic melts would account for the multistage B-metasomatism that occurred in the Alamo complex during the Variscan orogen.

Geochemical and multiple sulfur isotope study on tap and river water quality in the Beijing urban area

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Deterioration of tap and surface water quality in urban areas has become a major environmental concern worldwide. This study presents the first results of a pilot study on tap and river water in Beijing, China, using multiple sulfur isotopes ($\delta^{34}S_{SO4}$, $\Delta^{33}S_{SO4}$) in addition to a large number of physico-chemical and chemical parameters. The concentrations of most inorganic compounds (e.g. SO_4^{2-}, NO_3^-, As, heavy metals) analyzed for 59 tap water samples comply with the drinking water guideline limits as suggested by the WHO. In addition, the majority of 65 river water samples meet the national standards for surface water. However, NO_3^- shows concentrations between 50 and 97mg/L in 15.4% of the river water samples exceeding the maximum standard value of 44 mg/L. SO_4^{2-} concentrations are all below the guideline value of 250 mg/L for both tap and river water, although clearly higher compared to rivers in South China due to a drier climate with less precipitation coupled with urban pollution in the Beijing area. Similarly, $\delta^{34}S$ ranges from +6.4 to +15.4‰ for the vast majority of the tap and river water sulfates suggest urban sewage and chemical detergents as well as atmospheric deposition as the main sulfate sources in Beijing waters. $\Delta^{33}S$ values from -0.061 to -0.006‰ for tap water and between -0.061 and -0.017‰ for river water sulfate show no indication for microbial sulfur metabolism (e.g. sulfate reducers, sulfur disproportionators). In summary, the analyzed dissolved inorganic compounds in Beijing tap and river water do not cause a relevant decline in water quality. Forthcoming isotope data for NO_3^- ($\delta^{15}N$ and $\delta^{18}O$) and SO_4^{2-} ($\delta^{18}O$) will further strengthen the conclusions.

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