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Serpentine minerals discrimination by thermal analysis

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Abstract

This paper reports a complete set of TG, DTG, and DTA data, coupled with emitted gas analysis, for well-constrained, almost pure serpentine samples. Serpentine dehydroxylation takes place between 550 and 800 °C, with DTG and DTA peak temperatures progressively decreasing from antigorite (720 and 715 °C, respectively) to lizardite (708 and 714 °C), polygonal serpentine (685 and 691 °C), and chrysotile (650 and 654 °C). Antigorite has an additional diagnostic signal at ~740–760 °C, always absent in the other serpentines, and dependent on antigorite superperiodicity (*T* shift of ~20 °C from 36 to 49 Å modulation wavelength). A sharp exothermic peak occurs at extremely constant temperatures (~820 °C), independently from the starting serpentine structure. The high-*T* mineral assemblage is always represented by forsterite and enstatite.

Based on the observed relationships between serpentine structures and DTG/DTA dehydroxylation temperatures, thermal analysis may represent a useful tool for serpentine identification, particularly in the case of natural massive samples where different varieties are mutually intermixed. The accurate definition of serpentine mineralogy would have obvious implications in both geological-petrological and health-related issues.

Keywords: Serpentine, lizardite, antigorite, dehydroxylation, thermal analysis