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Hydrous species in crystalline and metamict titanites

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ABSTRACT

The content of hydrous species in crystalline and metamict titanite ($CaTiSiO_5$) have been investigated using polarized infrared spectroscopy. The effects of metamictization are a decrease of intensity and a broadening of Ti-O and Si-O stretching overtones, accompanied by development of the isotropic spectral features of hydrous species. Metamict and partially metamict titanites show OH contents up to 0.73 wt% H_2O on the basis of previously reported calibrations. On heating, crystalline and metamict titanite showed a different temperature evolution of their OH content. Thermal annealing of crystalline titanite at temperatures above 1100 K for 15 min resulted in dehydration, characterized by a dramatic decrease in the intensity of the OH signal near 3486 cm^{-1}, in contrast to a two-stage dehydration process in metamict titanite. The results show that the high OH contents in metamict titanites are probably due to hydrogen diffusion during and after metamictzation. The results also show that the recrystallization in metamict titanite at high temperatures involves epitaxial growth of crystalline domains.