MS20-P10 The structure of 10 Å phase formed by talc hydration at 450°c and 4 GPa: in situ diffraction study

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The interest to high-pressure hydrous silicates is related with the problem of water recycling within subducting lithosphere [1]. The 10 Å phase $Mg_3Si_4O_{10}(OH)_2 \bullet xH_2O$ is of special significance because its stability is intermediate between the minerals of oceanic peridotites (serpentine, talc, chlorite) and deep-seated silicates [2]. Previous structural studies of 10 Å phase were performed on quenched samples, whereas the analysis of *in-situ* structure could specify the equilibrium water content in it, which is still debatable [3].

The structure of 10 Å phase formed from the reaction of talc plus water at 450°C and 4 GPa was studied by powder diffraction using DAC with resistive heating. The diffraction experiments were performed at 4th beamline of VEPP-3 storage ring of SSTRC, Novosibirsk (l = 0.3685 Å). Rietveld method [4] was applied to refine the lattice parameters, atomic coordinates and the occupancy of interlayer H_2O site in the structure of 10 Å phase. The lattice parameters of 10 Å phase at 450°C / 4 GPa are a = 5.234(1), b = 9.053(2), c = 10.87(1) Å, b = 99.2(1)°, V = 508.5(6) Å^3 ($C2/m$). The best fit was obtained for the structure model with split position Ow of interlayer H_2O molecule (Fig. 1). The Ow site has three short (2.6 Å) Ow-O_{tetr} distances with corresponding angles Ð O_{tetr}-Ow-O_{tetr} of 101-108°, favorable for the orientation of protons towards tetrahedral O atoms. The half occupancy of the Ow site corresponds to one H_2O molecule per formula unit, which agrees with the recent estimations performed on quenched samples [3] and shows no significant change of water content during quenching.

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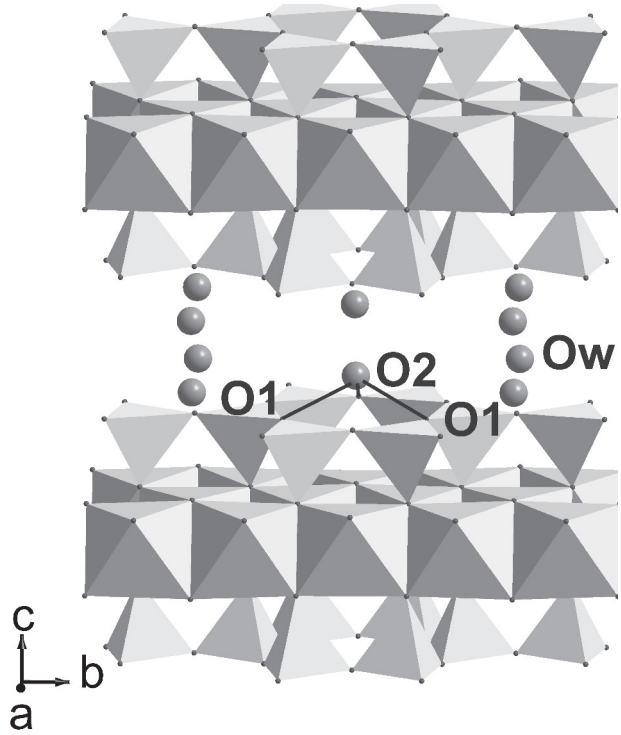

Figure 1. The crystal structure of 10 Å phase at 450°C and 4 GPa. The lines mark the short Ow-O_{tetr} distances.

Keywords: talc, 10 Å phase, powder diffraction, high pressure, high temperature.