EQUATION OF STATE OF ZIRCON-TYPE $TbVO_4$

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RVO_4 (R = Y, Sc, La – Lu) orthovanadates belong to a large class of AXO_4 compounds that typically adopt the structures of zircon, scheelite, fergusonite, monazite, wolframite, $CrVO_4$, $ZnSO_4$ and rutile types [1-3]. Phase relationships in this class, observed as a function of pressure have been systematized by Fukunaga and Yamaoka [2] and Errandonea and Manjón [4] (for all possible AXO_4 compounds), and by Kolitsch and Holtstam [3] for RXO_4 compounds (X = P, As, V). For RVO_4, R = Pr to Lu, the most stable ambient pressure structure is of zircon type, space group $I4_1/amd$, this structure can be also obtained for R = La using special preparation methods. The zircon-type RVO_4 orthovanadates exhibit physical properties that may lead to a number of applications. Known examples are the europium and neodymium doped YVO_4 crystals used as phospor and laser materials, respectively. Some of compounds of this family are considered as being suitable for optical waveguides and polarizers, they can be used for remote thermometry, as catalysts for oxidative dehydrogenation, and are candidates for advanced bio-imaging phosphors and as components of toughened ceramic composites.

A number of RVO_4 oxides have been studied at high-pressure conditions using the *in-situ* or *ex situ* X-ray diffraction and other methods. They are known to undergo an irreversible phase transition to scheelite-type structure. In this work, $TbVO_4$ is studied in the pressure range 0-7 GPa. The elastic properties of this oxide have been studied under pressure by an indirect technique, only, using the Raman spectroscopic data by Chen *et al.* [4]. The crystal investigated in the present work was grown from PbO/PbF_2 flux by the slow cooling method.

The *in-situ* X-ray diffraction experiments were conducted using the energy-dispersive method at the F2.1 beamline equipped with a large-anvil diffraction press,

MAX80. The pressure was calibrated using a NaCl equation of state. The lattice parameters of $TbVO_4$ were determined from Le Bail refinements performed with the Fullprof program. The bulk modulus calculated by fitting the second order Birch-Murnaghan equation of state to the unit-cell-volume dependence of pressure. The bulk modulus value, lattice parameter and axial ratio dependence on pressure will be shown.

References

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