Study of high temperature phase of titanate nanotubes

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Study of temperature stability of titanate nanotubes (Ti-NT) is important because some of possible applications of Ti-NT require heating [1]. By heating of Ti-NT titanate nanowires are obtained. Similarly to Ti-NT several possible phases of titanate nanowires can be discovered as for example: Na₂Ti₆O₁₃ [2], Na₂Ti₃O₇ [2], rutile phase of TiO₂ [2-4], anatase phase of TiO₂ [2], [3], beta TiO₂ [4]. The final structure depends also on the amount of sodium ions if some are present in original Ti-NT sample.

In this contribution, the structure of titanate nanowires was studied by combination of powder X-ray diffraction and 3D rotation electron diffraction. The titanate nanowires were prepared by heating of titanate nanotubes up to 850 C. The structure of final product at 850 C depends on heating conditions. If titanium nanotubes were heated in the air, two different particles with three different structures were obtained - Na₂Ti₆O₁₃ and two phases of TiO₂ - anatase and rutile. On the other hand, in vacuum only two phases of TiO₂ - anatase and rutile were detected.