*Poster*

# NOVEL ROUTE FOR PREPARATION OF MICRO- AND NANO-SCALE TUBULAR OXIDE STRUCTURES

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Nano- and microscale tubular structures have exceptional properties and have great potential as the building blocks of nano- and microdevices systems of high efficiency. This kind of structures have been for that the subject of intensive research. Since the discovery of carbon nanotubes [1] there has been active interest in exploring other layered and nonlayered materials that form tubular structures. Many different methods of obtaining various materials in nanotube form have been reported and summarized in revews [2].

$TiO_2$, $ZrO_2$ and $HfO_2$ are wide band gap materials of great interest since they can be used in sensorics [3], photocatalysis, electronics and solar cells. Metal oxide nanotubes have been obtained through various sol-gel related methods and the suggested formation models are often complemented or corrected afterwards [4]. Obviously, exploring different possibilities for obtaining tubular nano- and micro-sized materials and explaining their formation is of great importance in order to establish correct theorys and be able to synthesise materials with desired properties.

In present work we report a novel phenomenon and mechanism of low-dimensional tubular oxide structure formation. Microtubes of hafnium, zirconium (figure 1, 2) and titanium oxide were obtained by deposition of solvent free metal butoxide polymer layer on glass substrate and exposing it with controlled amount of humid atmosphere. Dissolving formed layered system in hexane led to the formation of microtubular oxide structures.

Current work include:

- Characterisation of formed tubular structures by AFM and SEM visualization.
- Observation effect of moisture content and temperature for the dimensions of formed particles.
- Observation the rate of polymerization of Ti, Zr and Hf alkoxides for the dimensions of forming tubular structures.
- Some possible mechanisms are also proposed to explain the formation of observed novel structures.

This work has been supported by ETF6537, ETF6660, ETF6163, SF0382149s02, Estonian Nanotechnology Competence Center and European Science Foundation programs Nanotribo and Molsim.

**References:**

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[4] Kukovecz, A., Hodos, M., Horvath, E., Radnoczi, G., Konya, Z., Kiricsi, I. Oriented Crystal Growth Model Explains the Formation of Titania Nanotubes. *J. Phys. Chem. B,* 2005, **109**, 17781-17783.

**Figures:**

Figure 2. Typical SEM image of tubular zirconium oxide structure.

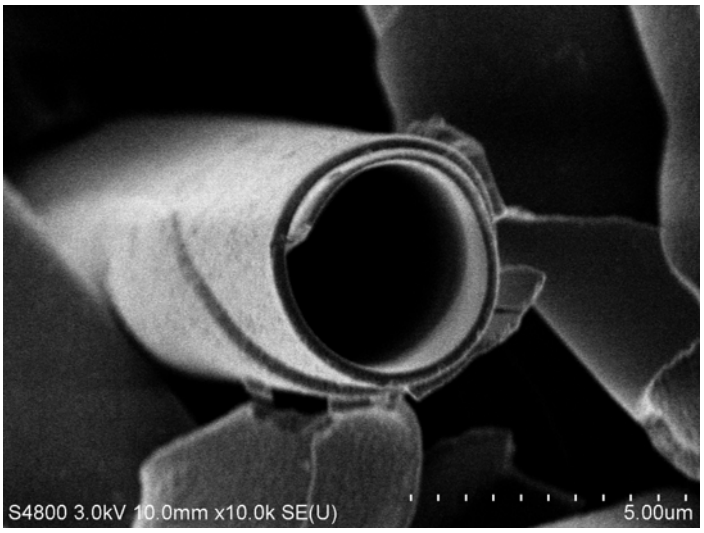


Figure 2. SEM image of tubular $ZrO_2$ structures.