Study toward size dependent solid state phase transition between γ-WO3 and ε-WO3 via in situ cryogenic Raman spectroscopy

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Publication date:
2022

Document Version
Peer reviewed version

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Study toward size dependent solid state phase transition between γ-WO_3 and ε-WO_3 via in situ cryogenic Raman spectroscopy

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Abstract:
The low-temperature WO_3 polymorph, ε-WO_3, has been shown to function as a highly sensitive and selective gas sensor for the detection of acetone, an important biomarker for metabolic disorders, and as the foundational material for various chromic devices. Unfortunately, the kinetic and thermodynamic characteristics of the phase transformation between the room-temperature γ-WO_3 and ε-WO_3 phase as well as the thermostability of the ε polymorph is limited. Here, the low temperature phase transformation from γ-WO_3 into ε-WO_3 is studied by using in-situ Raman spectroscopy. The results provide insight into the size dependency nature of this phase transformation. Specifically, the transformation onset temperature between γ-WO_3 and ε-WO_3 is confirmed to be linearly proportional to reciprocal of average crystallite radius, which can be explained by several published thermodynamic models.
[1] O.O. Abe, Z. Qiu, Z. Chen, J.R. Jinschek, P.-I. Gouma, Ceramics International 2021