



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

Abe, Owen O.; Qiu, Zanlin; Chen, Zexu; Jinschek, Joerg; Gouma, Pelagia Irene

Publication date:
2022

Document Version
Peer reviewed version

[Link back to DTU Orbit](#)

Citation (APA):

Abe, O. O., Qiu, Z., Chen, Z., Jinschek, J., & Gouma, P. I. (2022). *Study toward size dependent solid state phase transition between $-WO_3$ and $-WO_3$ via in situ cryogenic Raman spectroscopy*. Abstract from Materials Science & Technology Conference and Exhibition 2022, Pittsburgh, Pennsylvania, United States.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Title:

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

Owen Abe¹; Zanlin Qiu¹; Zexu Chen¹; Joerg Jinschek²; Pelagia-Irene Gouma¹;

¹ Ohio State University;

² Denmark Technical University

Abstract:

The low-temperature WO₃ polymorph, ϵ -WO₃, 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 -WO₃ and ϵ -WO₃ phase as well as the thermostability of the ϵ polymorph is limited. Here, the low temperature phase transformation from γ -WO₃ into ϵ -WO₃ 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 -WO₃ and ϵ -WO₃ 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