Institute of
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Long-Term Stability and Aging of VO_2 Thin Films

Background:

Understanding the long-term stability of VO_2 thin films is crucial for their integration into micro and nano-optical devices that require durability and reliability.

Objective:

The main goal of this research is to investigate the long-term stability and how prolonged aging effects the thermochromic behavior of VO_2 thin films. Especially how it evolves over extended periods when subjected to diverse environmental conditions. This investigation could include identifying the underlying mechanisms responsible for degradation due to the aging process and other possible factors like extended heating and switching. Furthermore, the study should evaluate the effects of different humidity levels and temperatures on these films. Based on the findings, the research should also lead to potential strategies that could be employed to mitigate or resist such degradation.

Methodology:

- Accelerated Aging Tests: Expose VO_2 thin films to accelerated aging conditions mimicking various climates (e.g., high humidity, high temperature, etc.)
- Stress Testing: Subject the VO_2 thin films to cycles of high-temperature heating followed by rapid cooling to simulate extended use and frequent switching.
- Test Mitigation Strategies: Apply potential protective coatings or treatments to the VO2 films based on previous literature to protect the films.
- Electrical and Optical Measurements: Utilize techniques like ellipsometry and Raman spectroscopy to determine changes in both electrical and optical properties of the films before and after aging.

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Literature:

M. Walther et al. (2023), *Switchable optics based on guided mode resonance in lithographically patterned vanadium dioxide with integrated heating layer.* http://dx.doi.org/10.1051/jeos/2023019

Zhongshao Li et al. (2022), *Deterioration mechanism of vanadium dioxide smart coatings during natural aging: Uncovering the role of water.* https://doi.org/10.1016/j.cej.2022.137556