

Proton Irradiation Influence on Metal-Insulator Transition of VO₂

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The impact of proton irradiation on the metal-insulator transition (MIT) of Vanadium dioxide (VO₂) was investigated through in-situ X-ray absorption fine structure (XAFS) and electrical resistance measurements. VO₂ films, approximately 100 nm thick, were fabricated using DC-sputtering deposition techniques. Protons with energies of 100 and 200 keV and fluxes of 10^{14} and 10^{16} protons/cm² were vertically irradiated at KOMAC. A pristine VO₂ film exhibited the MIT at approximately 72.5°C during heating. The transition temperature (T_c) of proton-irradiated VO₂ films with 100 keV energy and 10^{14} protons/cm² flux was around 75°C, while for the same energy but with 10^{16} protons/cm² flux, it was 52.5°C. The T_c of the proton-irradiated VO₂ film with 200 keV energy and 10^{13} protons/cm² flux was 77.5°C. XAFS measurements at the V K edge revealed the presence of V-V dimers in all VO₂ films in the metallic phase. The XAFS analysis indicated significant differences in the local structural properties around the V atom in the proton-irradiated VO₂ films, compared to the pristine VO₂, potentially influencing the T_c of VO₂. This study highlights the potential of proton irradiation techniques in tailoring the transition temperature of VO₂ films.

Paper submission Plan

No

Best Presentation

Yes

Contribution track

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