

Low Solar Absorptance, High Emittance Performance Thermochromic VO₂-Based Smart Radiator Device

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Determination of the deposition rate of a-Si, SiO₂, and VO₂

Amorphous silicon (a-Si):

Plasmlab system 100 PECVD (Plasma Enhanced Chemical Vapor Deposition) from Oxford Instruments was used to deposit a-Si layer using a gas mixture of SiH₄ and Ar using a pre-established recipe in the system for low-rate deposition. The substrate temperature is 350°C. Figure S3 represents the cross-section image of a layer deposited for 20 minutes on a quartz substrate. A thickness of about 540 nm is obtained. This corresponds to a deposition rate of approximately 0.45 nm/s for a-Si.

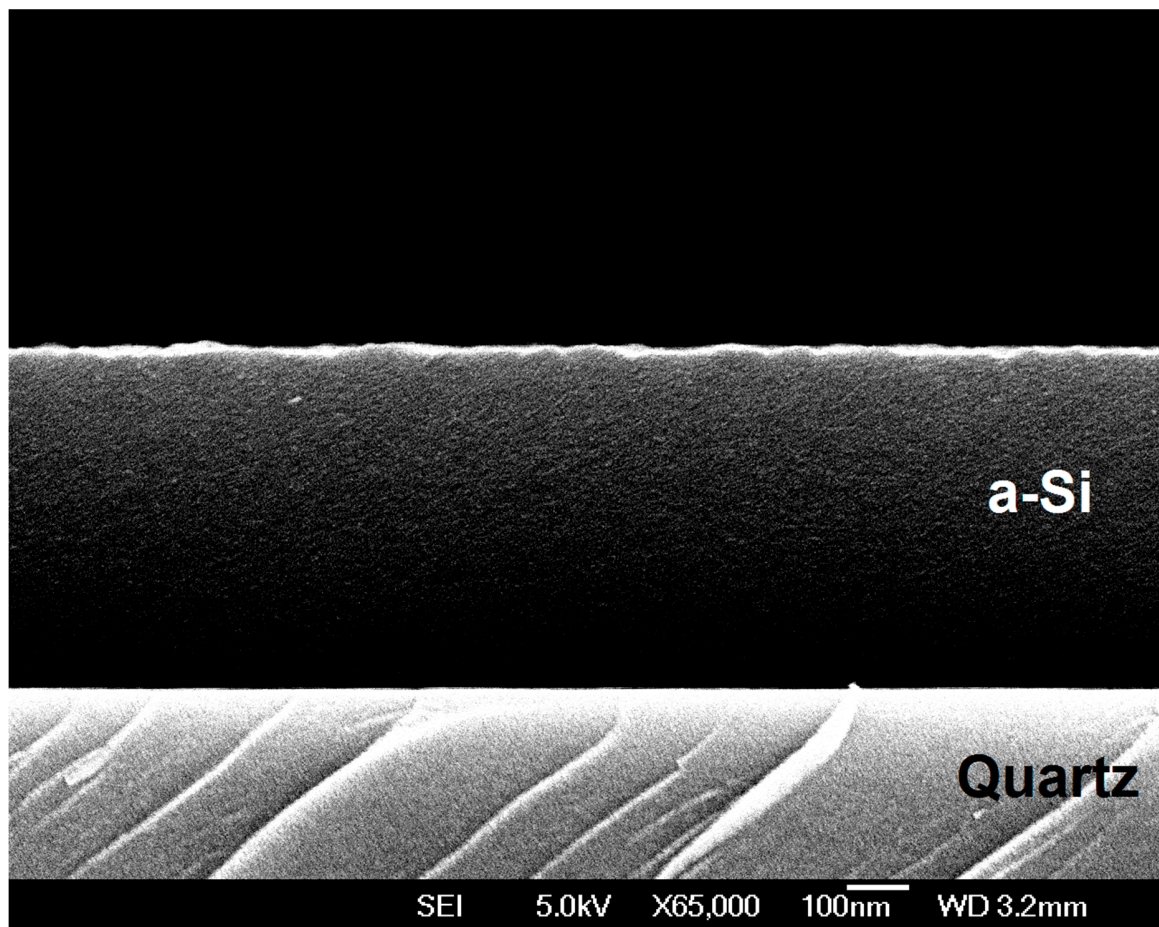


Figure S1. SEM Cross-section image of a-Si layer deposited at 350°C using PECVD on a quartz substrate. The thickness corresponds to a deposition time of 20 minutes.

Silicon dioxide SiO₂:

Plasmlab system 100 PECVD (Plasma Enhanced Chemical Vapor Deposition) from Oxford Instruments was used to deposit SiO₂ layer using a gas mixture of SiH₄, N₂O and N₂ using a pre-established recipe in the system. The substrate temperature is 390°C. Fig S1 represents the cross-section image of a layer deposited for 15 minutes on a silicon wafer substrate. A thickness of about 900 nm is obtained. This corresponds to a deposition rate of approximately 1 nm/s for SiO₂.

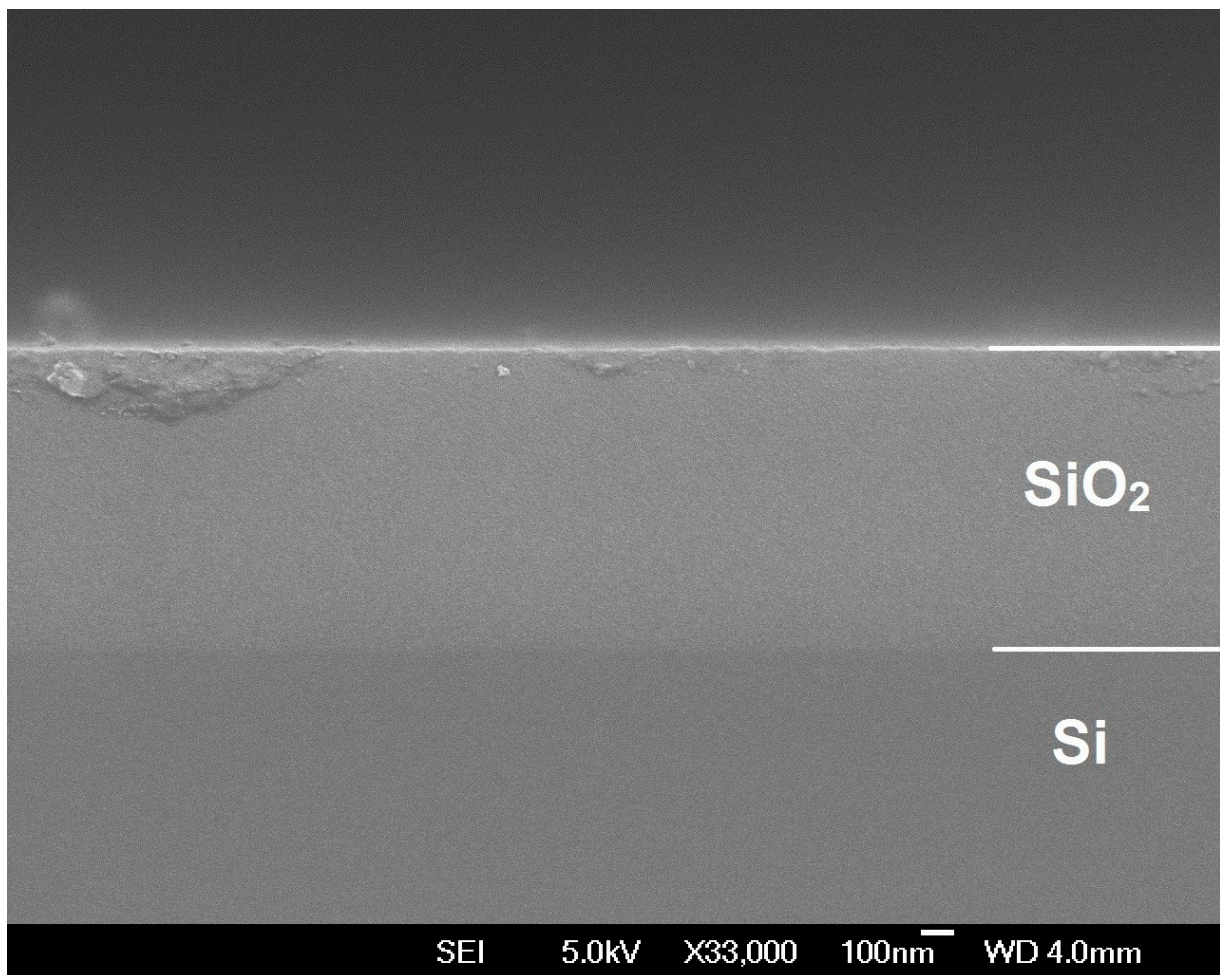


Figure S2. SEM Cross-section image of SiO₂ layer deposited at 390°C using PECVD on a silicon wafer. The thickness corresponds to a deposition time of 15 minutes.

Vanadium dioxide VO₂:

VO₂ film was deposited on a silicon wafer using a KrF excimer pulsed laser ($\lambda = 248$ nm, laser fluence equal to 1.8 J.cm^{-2}) focused on Vanadium target (99.9% pure) under 5 mTorr of oxygen ambient. The laser was pulsed at a frequency of 2 Hz. To establish the deposition rate accurately, the process was performed at room temperature (substrate temperature at 20 to 25°C). the deposition time was set at 5 hours (i.e., 36000 pulses). Figure S3 represents the cross-section image of the layer. A thickness of about 200 nm is obtained. This corresponds to a deposition rate of approximately 0.01 nm/s for VO₂.

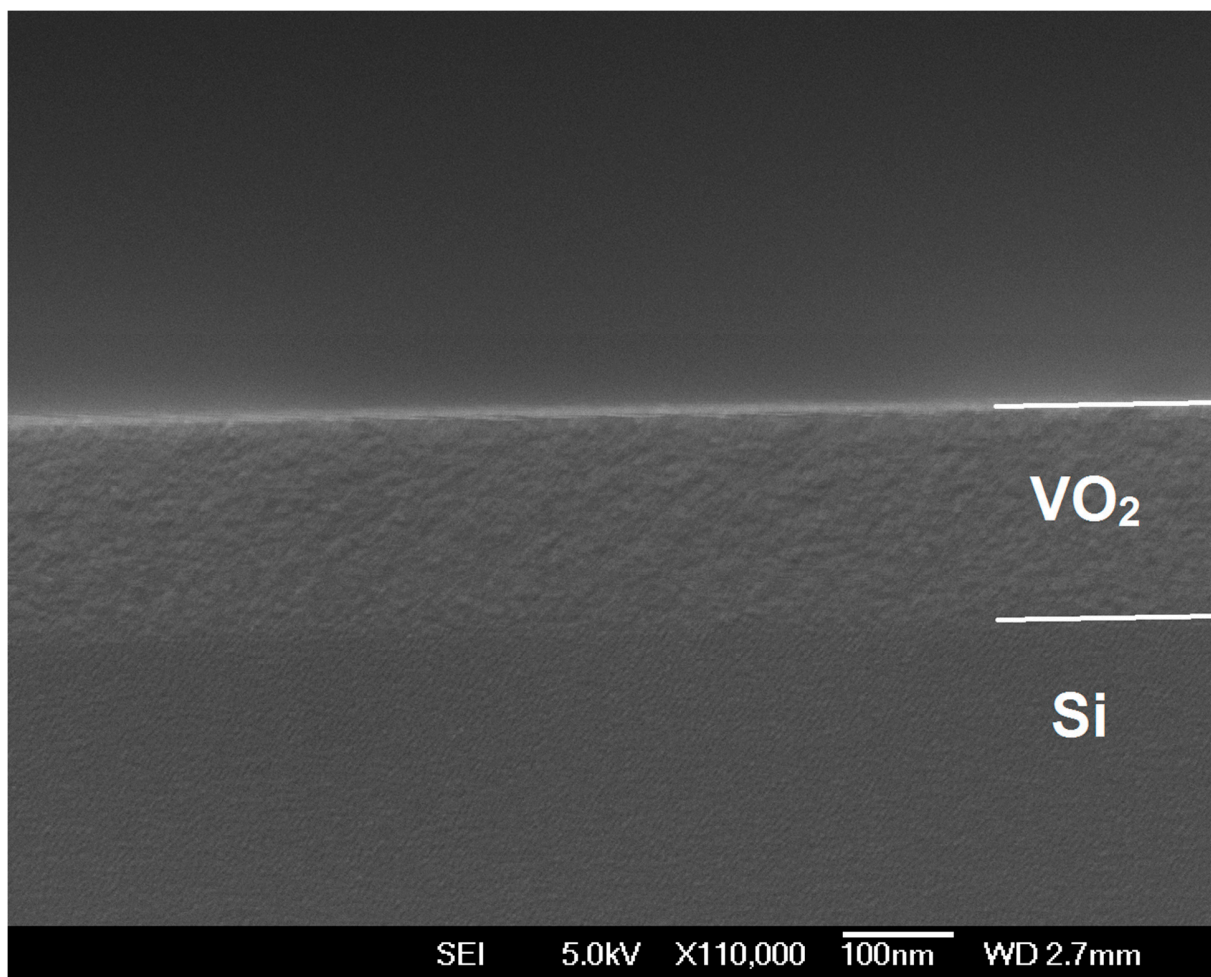


Figure S3. SEM Cross-section image of VO₂ layer deposited at room temperature using Pulsed Laser Deposition on a silicon wafer. The thickness corresponds to a deposition time of 5 hours.