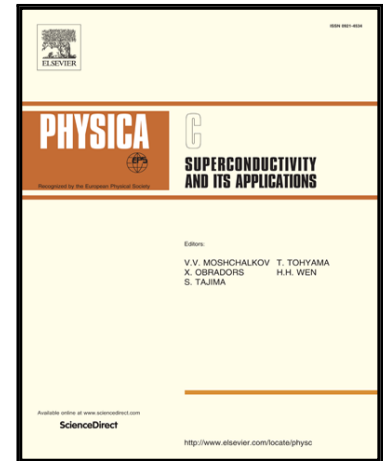


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Characterization of Surface Oxidation Layers on Ultrathin NbTiN Films

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Highlights

- By XRR at low angle and setting up the tri-oxidized-layer model to fit the XRR data, the thickness of each oxidized layer and the actual NbTiN layer below can be obtained.
- The oxidation of niobium and titanium is quite rapid even with a short exposure to the atmosphere, and it finally reached a saturation value of approximately 1.3 ± 0.1 nm when the exposure time was more than 70 h.
- The thickness of oxidized layers remains unchanged under heat treatment of 200 °C.
- The oxide phase Nb₂O₅ and TiO₂ localized at the outer surface partly dissolve after heating to more than 480 K that leads to the reduction of the total thickness of the oxide. Our approach can be applied for further understanding the surface properties of ultrathin NbTiN films and inspire the performance for NbTiN-based devices.

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