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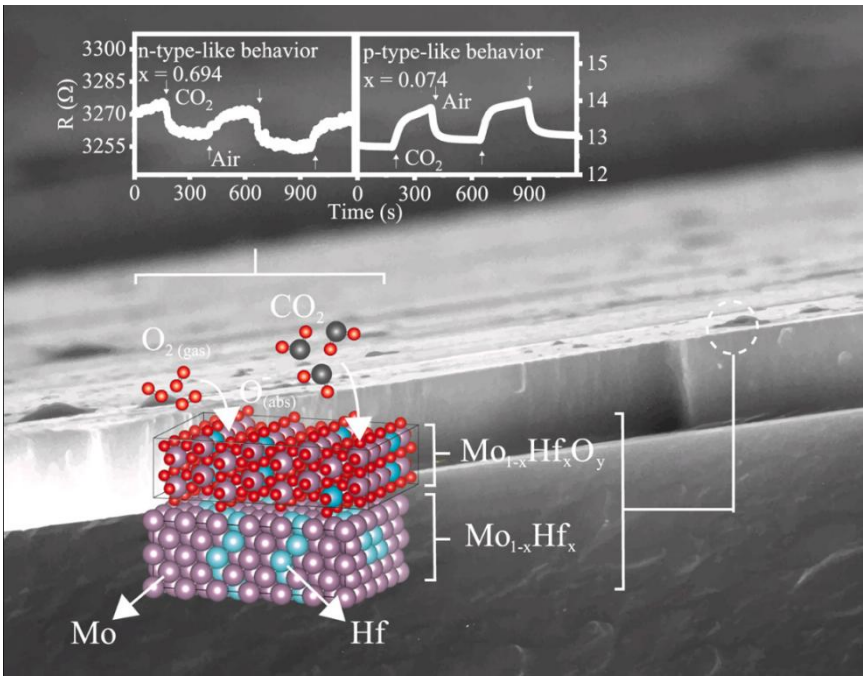
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ABSTRACT

Mo1−xHfx thin films with a compositional gradient were deposited by a co-sputtering process. Structural characterization by XRD, supported by Rietveld refinement, suggests that at low Hf concentrations the films exhibit an fcc-like structure, with a systematic increase in the lattice parameter as Hf content increases, consistent with Vegard's law. At higher Hf concentrations, the diffraction patterns evolve and are better described by a mixed-phase system involving hcp-Hf and bcc-Mo contributions, indicating the onset of phase coexistence. EDS confirms the compositional gradient and the effective incorporation of Hf into the Mo matrix, while scanning electron microscopy reveals position-dependent variations in morphology and thickness arising from different sputtering rates. XPS identifies the formation of native surface oxide layers and provides their chemical composition. Impedance spectroscopy measurements exhibit pronounced spatial variations in the electrical response, which are well described using equivalent electrical circuits and are consistent with the presence of these oxide layers. At Mo-rich regions, an inductive response is attributed to enhanced charge transport and current inertia effects in highly conductive areas. Finally, room-temperature gas-sensing measurements demonstrate an electrical response to CO2, revealing two distinct regimes: Hf-rich films exhibit an n-type-like response, whereas Mo-rich films show a p-type-like behavior.

Figure Caption:



KEYWORDS

$Mo_{1-x}Hf_x$ thin films; Compositional gradient; Magnetron sputtering;Surface oxide;Impedance spectroscopy;CO_2 gas sensing

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