Characterization of hafnium oxide thin films prepared by electron beam evaporation

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Abstract
Thin films of hafnium oxide were deposited by electron beam evaporation. The effects of the substrate temperature and the oxygen partial pressure on the refractive index and carbon monoxide sensing properties of the films were studied. The films were characterized using x-ray diffraction and x-ray photoelectron spectroscopy techniques. Films deposited on unheated substrates were amorphous, whereas those deposited on heated substrates showed a mixture of amorphous and polycrystalline structure. All the films were found to be optically inhomogeneous. The inhomogeneity of the films was taken into account in the determination of their refractive indices. It was found that the porosity (as reflected by the refractive indices) of the films was the main factor that affected the sensitivity of the films in relation to their detection of carbon monoxide.