Optical properties of highly transparent conductive uniaxial carbon films

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Abstract

We present the fabrication and optical characterisation of highly transparent and conductive carbon films. A modified filtered high current arc (HCA) evaporation process was used for the deposition. The large-area carbon films with thickness of few nanometres were deposited directly on a silicon wafer coated with 300 nm silicon dioxide and on quartz substrate. The orientation of the polycrystalline carbon layers can be adjusted. Introducing a hydrogen flow, the carbon layers are mainly parallel to the interface, whereas without hydrogen the orientation are predominantly perpendicular to the interface.

Variable angle spectroscopic ellipsometry measurements and transmission measurements were performed using *SENresearch SE 800 DUV 2C 16M* and *Perkin Elmer LAMBDA 1050 UV/Vis/NIR* devices in the spectral range from 190 nm to 980 nm and from 200 nm to 2500 nm, respectively. We used a uniaxial anisotropic layer model, where the optical axis is perpendicular to the sample surface, to determine the dispersions of the complex refractive index of ordinary and extraordinary rays. The optical model was supported by transmission electron microscopy (TEM) and atomic force microscopy (AFM) measurements.

Finally, we present a comparison of ordinary and extraordinary optical constants of the samples as well as the isotropic dispersion of graphene and few-layer graphene (FLG) prepared by different technological processes [1-3].

References

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