

INFRARED STUDY OF THERMALLY INDUCED PHASE SEPARATION IN SiO_x FILMS

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S u m m a r y

Thin SiO_x films ($x \approx 1.3$) obtained by thermal vacuum evaporation of silicon monoxide are studied. Thermally induced (annealing temperatures of 700 and 1000°C) structural transformations of the Si—O phase in SiO_x layers, which lead to the formation of amorphous or crystalline nanoinclusions, are investigated by IR-spectroscopy with the analysis of a shape of the Si—O absorption band. It is demonstrated that the thermal treatment induces the decomposition of molecular complexes of slightly oxidized Si and the formation of both Si clusters and molecular clusters containing heavily oxidized Si. The transformations of the oxide phase are almost completed after initial 5 minutes of thermal treatment. The films annealed at 700 °C contain mainly amorphous Si nanoclusters embedded in the homogeneous $\text{SiO}_{1.75}$ matrix (the volume share of the amorphous Si phase is $\sim 17\%$). The films annealed at 1000 °C can be represented in the form of Si nanocrystals (the volume share is $\sim 20\%$) surrounded by thin intermediate layers of SiO_x and embedded in SiO_2 .