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**Effects of Phosphorus on The Electrical Characteristics of Plasma Deposited
Hydrogenated Amorphous Silicon Carbide Thin Films**

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Abstract

The properties of phosphorus doped hydrogenated amorphous silicon carbide ($a\text{-SiC}_x\text{H}$) thin films, that were deposited by plasma enhanced chemical vapor deposition technique with four different carbon contents (x), were analyzed and compared with those of the intrinsic $a\text{-SiC}_x\text{H}$ thin films. The carbon contents of the films were determined by X-ray photoelectron spectroscopy. The thickness and optical energies, such as T_{auc} , E_{04} and Urbach energies, of the thin films were determined by UV-Visible transmittance spectroscopy. The electrical properties of the films, such as conductivities and activation energies were analyzed by temperature dependent current-voltage measurements. Finally, the conduction mechanisms of the films were investigated by numerical analysis, in which the standard transport mechanism in the extended states and the nearest neighbor hopping mechanism in the band tail states were taken into consideration. It was determined that, by the effect of phosphorus doping the dominant conduction mechanism was the standard transport mechanism for all carbon contents.

Keywords: Hydrogenated amorphous silicon carbide, phosphorus doping, conductivity, activation energy, standard transport model, nearest neighbor hopping

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