Hydrogenated ZnO thin film with p-type surface conductivity from plasma treatment

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Abstract
© 2017 IOP Publishing Ltd. Fabrication of a ZnO p-n homojunction within a single structure by a simple process is a challenging task. In this work, an intrinsic p-type surface conductive layer of ZnO with a controlled concentration of holes over n-type conductive bulk was obtained by a one-step room-temperature process via hydrogen plasma treatment. Non-contact surface sensitive techniques, such as Kelvin probe force microscopy and conductive force atomic microscopy, confirmed the existence of surface p-type conductivity through analyzing the distribution and concentration of charge carriers on the topmost surface of hydrogenated ZnO. A theoretical framework was constructed to provide a rationale of the p-type surface conductivity and justify its relation to the treatment time. It is believed that this finding will open a new possibility for the fabrication of ZnO based p-n junction devices.

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Keywords
hydrogen plasma, p-type, thin film, ZnO

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