On the Carrier Mobility of Nanocrystalline Si:H Films Made by Inductively Coupled Plasma with Low-Inductance Antenna

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P/n-type hydrogenated nanocrystalline silicon (nc-Si:H) thin films are prepared on a glass substrate by an inductively coupled plasma system, which employs four internal low-inductance antennae, with SiH_4, H_2 and B_2H_6/PH_3 as the precursor gases. By annealing the as-deposited nc-Si:H films in nitrogen in the range of 400 to 1000℃, it is found that both C_H and R ratio decrease with annealing temperature, whereas the electric conductivity increases which is mainly due to the increase of carrier mobility. On the other hand, similar increase of carrier mobility is also observed when reducing the total flow rate. While the former is explained by the breakdown of B-H/P-H complex, the latter is attributed to the shrinkage of incubation layer.

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