Sensitivity Analysis of Localized Gap State Parameters on the Optoelectronic Characteristics in Intrinsic Hydrogenated A

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ABSTRACT

In this thesis, numerical modeling is used to carry out the sensitivity analysis of gap state parameters on the optoelctronic , properties of intrinsic hydrogenated amorphous silicon (a-Si:H).Furthermore, the physical mechanism of these effects is then studied to predict how the gap state parameters and optoelectronic properties are correlated. This, together with the work on the correlation between deposition parameters and material properties of a-Si:H, can in principle yield the direction of further improvement of a-Si:H properties.Based on our modeling, it seems that lowering the density of valence band tail states would not increase photoconductivity effectively.Instead, numerical modeling reveals that there is still room for further improvement of optelectronic properties by reducing dangling band states. As far as carrier capture cross section is concerned, photoconductivity in a-Si:H is predominated determined by the energy states below dark Fermi level. Basically, its physical mechanism is somewhat similar to that of sensitizing states. It is evident that the existence of sensitizing states for electron is possible only for the states below dark Fermi level.

Keywords : intrinsic hydrogenated amorphous silicon

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