

Abstract

Thin films based on heterostructured mixture of amorphous and microcrystalline hydrogenated silicon have a perspective application in production of low-cost photovoltaic cells. Local electrical properties of silicon microcrystalline grains embedded in amorphous silicon phase were studied in nano- and microscale resolution. Measurements of film's surface topography and local electrical conductivity were performed with atomic force microscope (AFM) under standard ambient conditions. Scanning electron microscope and AFM observations identified a constant shape of microcrystalline grains. In the first approximation, the grain can be characterized as a cone with a spherical cap. A simplified finite element model of the crystalline grain was created in the Comsol Multiphysics simulation software and used for calculations of various grain's arrangements. The text includes experimental and theoretical points of view on thin-film's fine structure and its local electrical properties.

Keywords: Local electrical properties, microcrystalline silicon, thin films, atomic force microscopy, finite element method