

High Efficient Thin-Film Polycrystalline Silicon Solar
Cells using Metal-Induced Vertical Crystallization
Method

Young-Su Kim, Bong-Kwan Shin, Jea-Hwan Kwon, Se-
Wan Son, Yong-Woo Lee, Jin-Hyun Park, and Seung-Ki
Joo

Department of Materials Science and Engineering, Seoul
National University
309-Ho, 131-Dong, San 56-1 Sillim-Dong Kwanak-Gu,
Seoul, Korea, 151-742

Among the most promising technological alternatives for the development of photovoltaic modules and cells of a low cost, good energetic conversion and feasibility for mass production, polycrystalline silicon (poly-Si) thin film solar cells deposited directly on a transparent substrate are currently being considered the best.

We have developed novel crystallization of amorphous silicon (a-Si) thin-film and the crystallized silicon has vertical grains. These vertically crystallized grains make it possible for electron-hole pairs to diffuse out through grain without scattering like single crystalline silicon. 50nm-thick Ni layers were deposited on a-Si thin-films and the samples were annealing at 500 °C for crystallization and nickel silicides(NiSi₂) were formed. The Ni layers were removed and 100nm- thick amorphous silicon layers were deposited on them. The films were annealing 550 °C for crystallization then nickel silicides act like crystallization seed and crystallize the a-Si films above and poly-Si films that have vertical grains were formed. We named this method metal-induced vertical crystallization (MIVC).

We made cells using MIVC, and our results show a complete crystallization of silicon with a grain size of more than a micron, with a much less contents of Ni. The parameters of the cell estimated from the IV curve yield low values, FF<0.55, Jsc <10 mA and Voc<420 mV.