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<Invited Speaker>

## Fabrication of Ordered One-Dimensional Silicon Structures and Radial p-n Junction Solar Cell

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The new approaches for silicon solar cell of new concept have been actively conducted. Especially, solar cells with wire array structured radial p-n junctions has attracted considerable attention due to the unique advantages of orthogonalizing the direction of light absorption and charge separation while allowing for improved light scattering and trapping. One-dimensional semiconductor nano/micro structures should be fabricated for radial p-n junction solar cell. Most of silicon wire and/or pillar arrays have been fabricated by vapour-liquid-solid (VLS) growth because of its simple and cheap process. In the case of the VLS method has some weak points, that is, the incorporation of heavy metal catalysts into the growing silicon wire, the high temperature procedure. We have tried new approaches; one is electrochemical etching, the other is noble metal catalytic etching method to overcome those problems.

In this talk, the silicon pillar formation will be characterized by investigating the parameters of the electrochemical etching process such as HF concentration ratio of electrolyte, current density, back contact material, temperature of the solution, and large pre-pattern size and pitch. In the noble metal catalytic etching processes, the effect of solution composition and thickness of metal catalyst on the etching rate and morphologies of silicon was investigated. Finally, radial p-n junction wire arrays were fabricated by spin on doping (phosphor), starting from chemical etched p-Si wire arrays. In/Ga eutectic metal was used for contact metal. The energy conversion efficiency of radial p-n junction solar cell is discussed.

**Keywords:** solar cell, one-dimensional silicon, electrochemical etching