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Letter to the Editor

Comment on "Facile Deposition of Ultrafine Silver Particles on Silicon Surface Not Submerged in Precursor Solutions for Applications in Antireflective Layer"

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We have investigated the recent research article, titled "Facile Deposition of Ultrafine Silver Particles on Silicon Surface Not Submerged in Precursor Solutions for Applications in Antireflective Layer" by Jiang et al. [1]. The authors systematically organized the silver nanoparticles on Si substrates, which is a very effective approach to reduce the reflection by forming Si porous structures. The ultrafine porous Si showed significantly suppressed reflection about less than 5% for broad wavelengths. This result bears a high potential of Si photoelectric devices, including photodetectors and solar cells.

Nanostructures have a promising potential to enlarge the surface area, at a fixed volume, and thus simultaneously increase the light-reactive region of a solar cell. Additionally, the nanoscale structure is also efficient at reducing the light reflection of the incident light [2–4]. To have the optical advantage (less reflection) of Si structures is a significantly important benefit for the improvement of electrical aspects of devices. Ideal photoelectric devices can improve the performances due to the enhanced optical absorption.

Practically, however, the geometry tailoring of light-absorber readily causes recombination losses, which is inevitable concern for the most nanoscale patterned photoelectric devices. Researchers reported "zero" (or near zero) reflector by using various nanoscale entities. However, up to date, this state-of-the-art nanoscale zero reflector is not much effective to improve the practical solar cell performances. This is because of the overweighted design for optical aspects of nanoscale structured solar cells [5–9]. It also clearly suggests that there exists a discrepancy between the optical advantage and the electrical performances.

We expect the practical device performances from the silver nanoparticle-assisted Si nanostructures, which will provide a broad readership to researchers for the potential of ultrafine porous Si for photoelectric applications.

Otherwise, we may think about how we can realize the optical benefits of light management into electrically improved performances. This important issue can be resolved by using a conductive transparent material as multifunctional purpose. As an example, we can apply electrical conductor, such as indium-tin-oxide (ITO) or aluminum-doped ZnO (AZO), to the refractive-index matching entity. These transparent conducting materials may spontaneously reduce the electrical recombination loss by contributing to the transport of photogenerated carriers [3, 4]. Figure 1 is one of possible schemes of multifunctional nanostructured photoelectric devices.

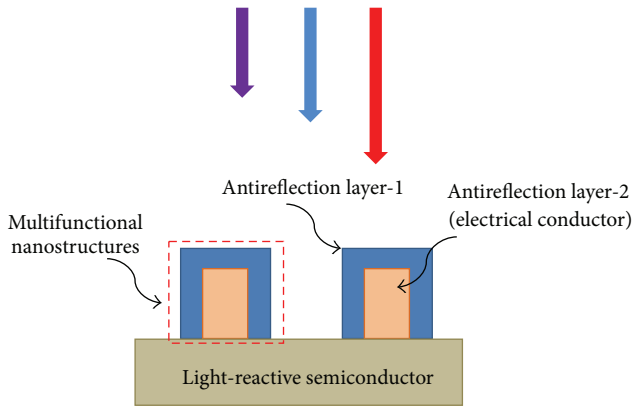

Figure 1: Suggested scheme: multifunctional designs of front structures for high-efficient nanoscale patterned photoelectric devices.

Conflict of Interests

The authors declare that there is no conflict of interests regarding commercial or financial relationships.

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