PASSIVATED CONTACTS FOR HIGH EFFICIENCY MONOCRYSTALLINE SILICON SOLAR CELLS

Sumit Agarwal, Department of Chemical and Biological Engineering, Colorado School of Mines

Global energy demands have been increasing, and the ability of fossil fuels to meet these demands is limited. Due to the associated climate change concerns, most of the current new energy installations have been based on renewable energy resources such as wind and solar. To further develop solar energy as a renewable energy resource, improvements in silicon-based solar cells, which represent more than 90% of the current photovoltaics market, is critical. In this presentation, I will discuss strategies to improve the efficiency of silicon solar cells via passivated contacts, which serve both as a contact layer and a passivation layer for the crystalline silicon (*c*-Si) surface. These types of contacts are considered a potential candidate for the next-generation industrially-manufactured *c*-Si solar cells. I will discuss the fabrication of these contacts and the underlying principle for charge transport through these contacts on both planar and textured surfaces. I will also discuss strategies to replace current solar cell metallization processes based on expensive Ag metal with inexpensive Cu, which necessitates a conductive Cu diffusion barrier interlayer between Cu and *c*-Si.

SUMIT AGARWAL is a Professor of Chemical and Biological Engineering at the Colorado School of Mines (CSM) since 2005. He joined CSM after his post-doctoral research at the University of Massachusetts – Amherst. Prior to this, he received his Ph.D. in Chemical Engineering from the University of California – Santa Barbara, and his M.S. and B. Tech. degrees from the University of New Mexico and the Indian Institute of Technology, Varanasi, respectively. His current research is focused on studying surface processes during atomic layer processing of materials for semiconductor applications, plasma processing of materials, and development of industrially-relevant fabrication techniques for ultra-high-efficiency crystalline silicon solar cells. He has received the Paul Holloway Young Investigator Award from the AVS and the NSF CARRER Award. He was the Program Chair for the 3rd International Workshop on Atomic Layer Etching in 2016, Program Chair of the Plasma Science and Technology Division of the AVS also in 2016, and Program Chair for the 19th International Conference on Atomic Layer Deposition held in 2019.