observed kinetic phenomena remarkably analogous to those reported for atomic-scale systems, including parameters for stable nucleation and island growth as well as the existence of step-corner and step-edge kinetic barriers. The researchers said that although atomic-scale kinetic models successfully predict much of the observed behavior, the actual forces governing the behavior are likely to be significantly different due to the change in size scale. This model system has also been artificially constrained to mimic the behavior of atomic monolayers, and the familiar phenomena observed for this system may not apply more generally to other micro- and nanoscale-based materials systems. Nonetheless, this research points the way to more rigorous study of the mechanics behind materials designed at this intermediate size scale.

KRISTA L. NIECE

Radial *p-n* Junction Enhances Light-Trapping in Si Nanowire Solar Cells

When used in combination with inexpensive substrates to reduce the fabrication cost of photovoltaic cells, thin-film semiconducting materials must possess either a high absorption coefficient or excellent light-trapping capabilities to overcome the resulting short optical path length and minority carrier diffusion length. While solar cells with nano-structured radial *p-n* junctions are known to have low reflective losses compared to their planar counterparts, their light-trapping properties have not been measured. E. Garnett and P. Yang at the University of California, Berkeley, however, have recently developed a simple and scalable method to fabricate large-area silicon nanowire radial *p-n* junction photovoltaics (with efficiencies between 5–6%) and have quantitatively measured extraordinary enhancements in the light-trapping path length of up to a factor of 73, which is beyond the randomized scattering (Lambertian) limit.

As described in the January 28 online edition of *Nano Letters* (DOI: 10.1021/nl100161z), the processing of these ordered nanowire arrays involves dip coating *n*-type silicon substrates to self-assemble silica spheres, deep reactive ion etching (DRIE) to form the arrays, bead removal in hydrofluoric acid, and boron diffusion to form the radial *p-n* junctions. The resulting nanowire arrays showed excellent packing and uniformity that extends over large areas (up to 10 cm²). To mimic the photovoltaic response of very thin (8 μm and 20 μm) silicon solar cells, very highly doped *n*-type silicon wafers topped with a thin, lightly doped epitaxial layer were used as the substrates. In addition, this simple method of varying the thickness of the silicon solar cells enabled quantitative measurement of their light trapping efficiency.

A maximum light-trapping path length enhancement factor between 1.7 and 73 (depending on the nanowire geometry) was recorded using optical transmission and photocurrent measurements. Longer nanowires led to both increased recombination and higher absorption, with the light-trapping effect dominating for the 8-μm thin silicon absorbing layers. Because of the incredible light-trapping effect, the overall efficiency for the 8 μm absorber silicon nanowire array solar cells is ~20% higher than results on 8-μm thick silicon ribbon solar cells. Efficiencies between 5–6% were achieved for the nanowire array solar cells on 8 μm and 20 μm silicon absorber layers. However, it should be noted that no surface passivation (which is known to be important in high-performance planar solar cells) was performed.

The researchers said that it should, in principle, be possible to extend their fabrication approach to multicrystalline silicon (or other semiconductor) thin films deposited on low-cost substrates (such as glass, aluminum, or metallurgical grade silicon). By providing a means to reduce both the quantity and quality of the required silicon semiconductor and with the application of proper surface treatments, this ordered vertical nanowire array geometry represents an economically viable path toward the large scale implementation of high-efficiency, thin-film solar cells.

TIFFANY D. ZIEBELL

News of MRS Members/Materials Researchers

Praveen Chaudhari, former Director and Vice-President, Science, for IBM research laboratories worldwide, passed away at the age of 73 on January 13, 2010, at his home in Briarcliff Manor, New York, after a battle with cancer. He is survived by his widow, Karin, son, Ashok, and daughter, Pia.

Born in Ludhiana, Punjab, India, on November 30, 1937, Praveen was educated at Indian Institute of Technology, Kharagpur, (BTech degree, 1961) and the Massachusetts Institute of Technology (PhD degree, physical metallurgy, 1966). He joined the IBM Thomas J. Watson Research Center in 1966, and enjoyed a long and extremely distinguished career as one of the foremost scientists and scientific directors in an age of extraordinary innovations, many of which he helped bring about. Perhaps his greatest scientific breakthrough, along with two other IBM researchers, was the discovery of magneto-optic materials that significantly impacted the optical data storage industry. In recognition of this seminal work, he was awarded the National Medal of Technology by President Bill Clinton in 1995.

He made important contributions to many other areas of science, including structure and properties of amorphous solids, defects in solids, quantum transport in disordered systems, liquid crystal alignment on substrates, and high temperature superconductivity. Soon after the discovery of superconductivity above liquid nitrogen temperature in the cuprate superconductor $YBa_2Cu_3O_{7-\delta}$ (YBCO), Praveen and his IBM colleagues demonstrated the growth of epitaxial films of this material that could sustain very high critical current densities (10^5–10^6 A/cm² at 77 K), more than enough for practical applications. This was quickly followed by the conclusive confirmation of the deleterious influence of grain boundaries in YBCO and other superconducting cuprates in limiting the critical current density. Working with a group of talented visiting scientists and colleagues at IBM, Praveen made the ingenious use of bicrystal strontium titanate substrates to show that the superconducting coupling across a grain boundary varies almost exponentially with the misorientation angle, and that large-angle boundaries can be exploited for fabricating superconducting quantum interference (SQUID) devices. Such SQUID devices are currently being used for a number of biomedical and medical imaging applications, while the promising development of high temperature superconducting cables has