TMS Member Profiles

Meet a Member: Jay Narayan Named 2011 *Acta Materialia* Gold Medal Recipient

By Lynne Robinson

"Materials science is an enabling science which connects us to technology and society. This aspect of materials fascinated me the most," recalls Jagdish (Jay) Narayan of his decision to switch from mechanical engineering to materials as an undergraduate student at the Indian Institute of Technology Kanpur. "I realized that major changes in our civilization have occurred as a result of materials revolutions—from stone, to iron, to bronze, to semiconductor. Everything is made out of materials—and the bottleneck for every new technology is often materials."

Breaking those bottlenecks has been Narayan's professional mission for nearly 40 years, with his many contributions most recently being recognized with the 2011 *Acta Materialia* Gold Medal and Prize. *Acta Materialia*, Inc. represents 33 professional societies worldwide in publishing two highly regarded international journals. Awarded by the *Acta Materialia* Board of Governors, the Gold Medal honors one exceptional person annually for lifetime achievements in materials science research and leadership. "I am deeply honored and profoundly humbled by this international recognition by my peers," said Narayan, the North Carolina State University John C.C. Fan Family Distinguished Chair Professor, Materials Science and Engineering. "This is also very special because I published my first three papers in *Acta* journals."

The path leading Narayan to many of his discoveries began at the University of California, Berkeley, where he earned both his master's degree and Ph.D. in just two years. "I realized very quickly that the property of every solid state material is controlled largely by defects and interfaces, grain boundaries included," he said. "Using laser-based processing methods, it was possible for me to control the micro-

structure and create exciting materials with unique properties and profound implications for solid state devices."

Since then, Narayan has made fundamental contributions in defects, diffusion, ion implantation, and laser-solid interactions. These, in turn, have led to

Jagdish (Jay) Narayan: "I am very excited about the future of materials science. Nanotechnology innovations, for instance, are leading to super strong materials, high-efficiency LEDs for solid state lighting, and improvement in fuel efficiency and reduction in environmental pollution."

major materials breakthroughs, including laser-diffused solar cells, formation of supersaturated semiconductor alloys, metal-ceramic nanocomposites, novel ZnMgO and ZnCdO alloys, ZnO-based transparent conductors, and new nanostructured materials with improved properties. Narayan said he is particularly pleased with his invention of domain matching epitaxy, which is based on matching integral multiples of lattice planes across the film-substrate interface to address epitaxial growth across the misfit scale on polar, as well as nonpolar, substrates. He also cites his development of quantum-confined GaN-based NanoPocket LEDs as

another career highlight. "These stand to revolutionize next-generation solid state devices with integrated functionality," he said.

Mostly, looking back on his career, Narayan said he feels "very fortunate to have a large number of very talented graduate students, post docs, and collaborators worldwide."

A TMS Life Member and 1999 TMS Fellow, Narayan notes that, in his experience, few achievements come without first having to overcome any number of challenges. It's important, he cautions, that scientists and engineers just entering the field learn to take these in stride. "Sometimes, you have to stop pursuing certain research, no matter how exciting it is, because funding for it has ended," he said. "You have to spend a lot more time managing your research now—It leaves that much less time for innovative thinking and takes time away from your family and personal life, which is unhealthy and unsustainable. It is important to find a balance, have fun, and do some good for society through your research innovations."

Making an impact on society, whether improving health and healing through biomedical advances or addressing global energy and sustainability issues, is well within the grasp of any materials scientist and engineer, said Narayan, observing, "For every advanced technology, there is a materials problem which needs a solution."

Details on events and symposia celebrating this pinnacle achievement in Narayan's career will be announced at a later date.

Each month, *JOM* profiles a TMS member and his or her activities both in and out of the realm of materials science and engineering. To suggest a candidate for this feature, contact Maureen Byko, *JOM* editor, at mbyko@tms.org.