In this presentation, we discuss several new materials that have the potential to enhance efficiencies and lower costs for solar cells. These materials may also enable new flexible solar cells, that are lightweight and bendable. First, we review several components in a conventional expensive, bulky, rigid, and brittle solar cell. This includes an antireflection coating, front contact, and absorber region region. Then, we discuss my research group's research in several new materials for each of these components. This includes nanosphere coatings for the antireflection layer, various metal and graphene structures for the front contact, and nanowires, nanocones, and ultrathin films for the absorber region. We demonstrate simulations and experimental results for these various structures, and demonstrate how they may enable new types of solar cells in the future.

Bio: Dr. Paul W. Leu received his B.S. in Mechanical Engineering from Rice University in 2002. He received his M.S. and Ph.D. from Stanford University in 2006 and 2008 respectively. From 2008–10, he worked as a postdoctoral fellow in the department of Electrical Engineering and Computer Sciences at the University of California, Berkeley with a joint appointment at Lawrence Berkeley National Laboratory. He has been an Assistant Professor in the Department of Industrial Engineering at the University of Pittsburgh since August, 2010. He has secured over $1 million in research funding, primarily through 4 NSF grants and won an Oak Ridge Associated University Powe Junior Faculty Enhancement Award. His research group’s areas of expertise include solar cells, nanomanufacturing, and simulation-based design.