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Energy Quarterly

News and analysis on materials solutions to energy challenges

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MRS Bulletin

Engaging bright minds to create a bright future

Of the 7 billion people on the planet, approximately 3 billion in the developing world have either no or extremely limited access to electricity. In the majority of countries in sub-Saharan Africa, ~25% of the population has access to electricity. These numbers are staggering. In the developed world, not only does the entire population have access to electricity, the consumption rates are high, ranging from 4000 to 16,000 kWh (or higher) annually per capita. In much of the developing world, the annual per capita use of electricity is a fraction of that, less than 500 kWh (World Bank, 2007). This is the equivalent of operating two 60-watt light bulbs for 12 h a day. Yet, access to electricity, particularly at these low consumption levels, is highly correlated with the quality of life. The human development index (HDI), an integrated measure of life expectancy, literacy, education, and standards of living, increases by a factor of 3 for an increase in electricity consumption from 100 kWh to 2000 kWh. While both electricity consumption and HDI could reflect the overall state of economic development in any given country, it is more likely that the correlation reflects a direct cause and effect relationship. Thus, expanding access for 3 billion of our co-inhabitants on this planet to even moderate levels of electricity has the potential for an enormous impact. And in light of ever-rising carbon emissions, global temperatures, and sea levels, it behooves all of us for this expanded access to derive from carbon-free energy sources.

So is it possible for Earth to provide electricity to those struggling for their daily survival without digging deeper into her bank of fossil fuels? The question immediately becomes one of cost. Can electricity from carbon-free sources become economically accessible before that from coal? Can it become sufficiently inexpensive to lift the developing world into the ranks of the developed in our lifetime? This is where investments in materials research are beginning to pay off. Solar electricity, for example, has undergone a spectacular drop in cost; today, it is half the price it was five years ago. Similar trends hold for wind power and for batteries that help overcome the intermittencies of these sources. These dramatic trends are the result of breakthroughs in materials discovery, design, and manufacturing. The next stage in this process will be to engage the bright minds in the developing world, a vast and underutilized intellectual resource, to help advance these solutions to even higher levels. This was the premise behind the 2016 JUAMI School on Materials for Sustainable Energy Technologies, held in Arusha, Tanzania (see the article on JUAMI that appears in the August 2016 issue of *MRS Bulletin*). The innovative collaborative research ideas that emerged from this two-week school may well hold the key to a sustainable energy future for all.

Sossina M. Haile and **Arun Majumdar**

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