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**The stuff we need for clean energy**

Here is another issue of *MRS Bulletin Energy Quarterly* devoted to the ways in which materials can help in the quest for a sustainable energy supply. According to the Organization for Economic Cooperation and Development, the world's middle class will grow from about 1.8 billion people today to 5 billion in 2030; and if there is one thing we know about the middle class, it is that they consume energy. The challenge is huge. The world has to grow its energy delivery capacity and somehow reduce the environmental impact of all that energy conversion too.

A challenge is just an opportunity in disguise, and the opportunity is to build a clean, efficient, and sustainable energy conversion infrastructure worldwide. That's the upside. The downside is that if we miss this opportunity, then we will go decades into the future using technologies that impair our environment.

Many things influence the choice between clean technologies and traditional ones, but the first is always cost. New technologies must either be cheaper than the ones they replace, or offer something that the consumer is really interested in buying: energy is about as basic a commodity as there is, so cost tends to win over enhanced features, especially invisible ones such as low environmental impact. A second "decider" has emerged in recent years, and it is the materials. Cleaner energy production and more efficient consumption tend to rely on technologies that use more specialized materials like neodymium and dysprosium for generators and motors, terbium and europium for phosphors, lithium for batteries, and many others that are required to make advanced technologies work. Large-scale deployment demands large supplies of materials, and the lack of a supply chain can prevent a technology from taking hold. As we consider what our materials can do for the energy economy, we also need to know where those materials are going to come from, and how much they will cost.

Nothing is available without the right materials. And certainly not clean energy.

Alex King

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