Energy Quarterly

News and analysis on materials solutions to energy challenges

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Inside:

Images incorporated to create the energy puzzle concept used under license from Shutterstock.com.

"Manufacturing Li-ion batteries for safety and performance" title image: AllCell Technologies' Phase Change Composite (PCC) system. The small cylindrical cells are in red, and the composite is the packaging material around the cells in black. Image courtesy of AllCell.

"How green is your electric vehicle?" title image credit: DDOT DC, Flickr Creative Commons.

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MRS Bulletin

The role of the materials scientist in battery safety

There has been much negative news in the last few years about the safety of lithium batteries, from the Boeing 787 Dreamliner to hoverboards to the Samsung Note 7 phone. In each of these cases, there were multiple design and/or manufacturing problems in the batteries and control systems, which should have been identified by the manufacturer or upon importation. However, these failures occurred in less than one in a million batteries. Many manufacturers have built-in safety mechanisms. An example is the 17-in. Apple MacBook laptop, which saw many battery failures in the first 12 months. After failure, however, battery control circuits prevented any further use. There were no reported fires or human damage from these.

These problems, including notices in every airport about the Samsung Galaxy Note 7 ban, have made the public skeptical about the safety of lithium batteries. Beyond the general public, firefighters and emergency personnel worry about how to deal with high voltages in crashed electric vehicles: There have been instances of fires in electric vehicles. An upcoming concern is where to place large backup batteries in tall buildings to increase resiliency in the event of storms. The roof is out of the question, as firefighter ladders cannot reach them, and the basement is ruled out because of flooding concerns. The batteries are thus typically placed around the fourth floor, and the surrounding building has to be made fireproof.

As larger batteries become more popular, in vehicles or for energy storage in buildings, it is important for materials scientists to develop built-in sensors that can identify failures before they become critical and shut down the battery. A temperature sensor may have averted the fast charging of the batteries in the Boeing 787 and perhaps a Tesla car, when the battery was below freezing temperature. It could have stopped the charging from taking place or at least limited the initial current until the cell was warm.

The materials scientist, beyond inventing/developing the next generation of high energy density batteries, must also be willing to educate the public and professionals about the appropriate handling of these batteries and not allow design corners to be cut. A series of recent Battery Safety Summits have initiated this educational process, with firefighters and pilots as dominant attendees.

The MRS Fall and Spring Meetings would be a good platform for one-day battery safety workshops for professionals. We as scientists must help eliminate the all too common hype about batteries, whether it is the next great breakthrough or the totally safe battery—no energy-storage system can be totally safe. We can make the battery and the control and power handling systems safer.

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