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NEWSLETTER

EPA's Draft Life Cycle Analysis for Lithium-ion Batteries Makes Recommendations for Future Battery Production

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The Environmental Protection Agency (EPA) recently released a draft Life Cycle Assessment (LCA) of Lithium-ion Batteries and Nanotechnology for Electric Vehicles. The draft studies the environmental impacts of three Li-ion battery chemistries currently used in electric and plug-in hybrid electric vehicles and a new technology under development that would utilize single-walled carbon nanotubes (SWCNTs) in Li-ion battery anodes to increase energy density. EPA anticipates that the LCA results will "mitigate current and future impacts and risks by helping battery manufacturers and suppliers identify which materials and processes are likely to pose the greatest impacts or potential risks to public health or the environment throughout the life cycle of their products."

Lithium-ion battery manufacturers, research and trade organizations, battery recycling companies, and the Department of Energy's Argonne National Laboratory all provided EPA with input to aid in the development of this report.

A key component of the study includes a comparison of energy consumption and health and ecological impacts of the three current Li-ion battery chemistries: lithium-manganese oxide, lithium-nickel-cobalt-manganese-oxide, and lithium-iron phosphate. A subset of the ten impact categories assessed include global warming potential, ecological toxicity potential, human toxicity potential, occupational cancer and non-cancer hazards, and ozone depletion potential. The benefits and drawbacks of SWCNTs are separately discussed.

The report includes a series of recommendations for "opportunities for improvement," including: 1) increasing battery lifetime; 2) reducing cobalt and nickel material use; 3) reducing the percentage of metals by mass; 4) incorporating recovered materials into new batteries; 5) using a solvent-less process in battery manufacturing; 6) evaluating means to reduce primary energy use for the cathode; 7) lowering the energy intensity of manufacturing SWCNT anodes; and 8) reducing the carbon intensity (*e.g.*, coal dependence) of the grid.

EPA says it hopes that industry will use these "opportunities" to inform design changes that will result in an overall reduction in environmental impacts, including using fewer toxic materials, while increasing energy efficiency. EPA asserts the draft LCA has "the potential to drive a significant reduction of potential

environmental impacts and risks, given that advanced batteries are an emerging and growing technology." Battery manufacturers should stay tuned to EPA's Design for the Environment Program for more recommendations and best practices.