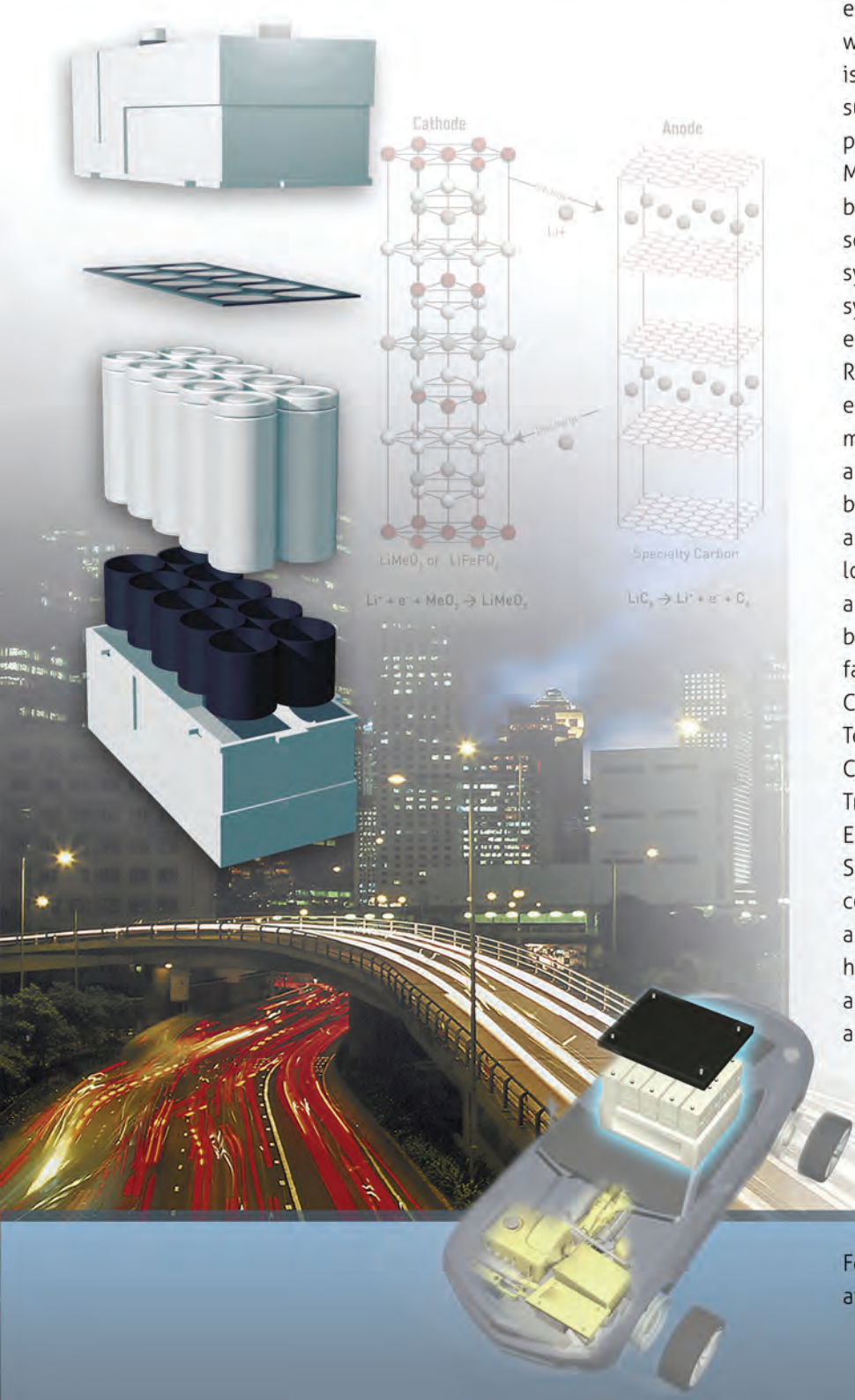
OAK RIDGE NATIONAL LABORATORY

ENERGY STORAGE
CHALLENGES AND OPPORTUNITIES



High-performance batteries are projected to be the leapfrog technology for drivetrain electrification and to provide stationary storage solutions that will enable the effective use of renewable energy sources, significantly reducing the United States' dependence on foreign oil. Extensive research and development have enhanced the technology to a stage at which it seems very likely that safe and reliable lithium-ion batteries will soon be included in hybrid-electric and electric vehicles and connected to solar cells and windmills. However, the safety of the technology is still a concern, battery service life is not yet sufficient, and costs are too high. New materials-processing technology is needed to reduce cost. Mechanical degradation and fatigue have to be better understood to allow microstructural solutions to new and advanced energy storage systems. New electrochemical energy storage systems are needed to significantly increase energy density. To meet these challenges, Oak Ridge National Laboratory (ORNL) scientists and engineers are concentrating their expertise in materials characterization, materials processing, and materials and systems simulations to identify battery performance and lifetime limitation and develop revolutionary technologies and low-cost processing for next-generation batteries and manufacturing processes. ORNL offers battery researchers access to several user facilities in which to perform their work: the Center for Nanophase Materials Sciences, High Temperature Materials Laboratory, National Center for Computational Sciences, National Transportation Research Center, Shared Research Equipment User Facility, and Spallation Neutron Source. These highly sophisticated facilities combined with the lab's world-class scientists and researchers give ORNL the tools it needs to help satisfy America's demand for hybrid-electric and electric vehicles that are safe and affordable and increase our country's energy independence.

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