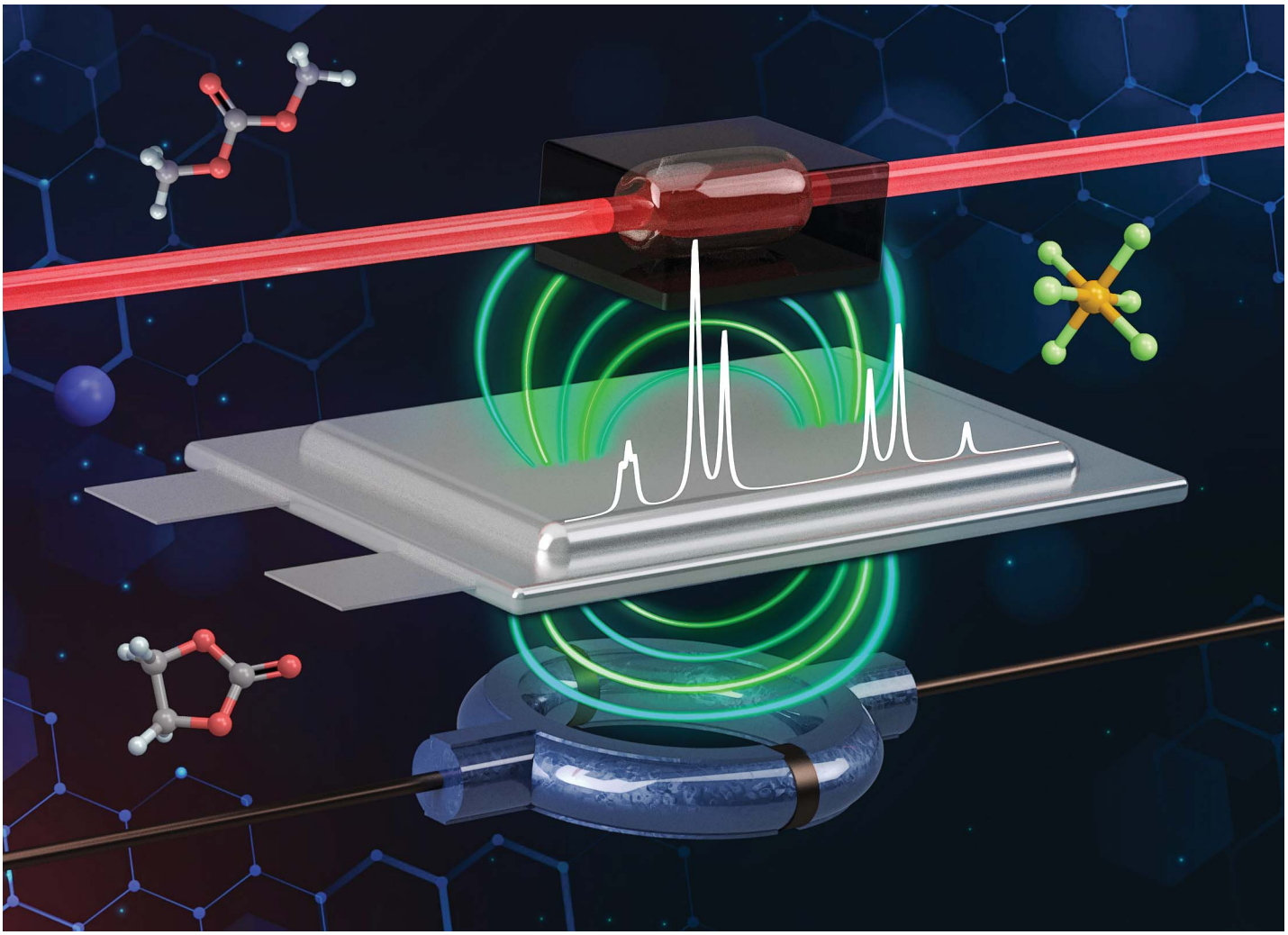

Showcasing research from an international collaboration among the Helmholtz Institute Mainz (GSI Helmholtzzentrum für Schwerionenforschung), University of Mainz, Germany, the Department of Chemistry, New York University, USA, the Department of Biosignals, Physikalisch-Technische Bundesanstalt Berlin, Germany, and the Department of Materials, University of Oxford, UK.

Enabling nondestructive observation of electrolyte composition in batteries with ultralow-field nuclear magnetic resonance

Diagnostics of rechargeable battery cells are of particular importance for the electric-vehicle industry, but there is a lack of methods for directly accessing the state of the battery electrolyte. Conventional nuclear-magnetic-resonance (NMR) spectroscopy suffers from skin-depth limitations, whereby the MHz–GHz electromagnetic fields used for spin excitation and detection cannot penetrate metallic battery housing and electrodes. Here we demonstrate chemical fingerprinting of lithium-ion electrolyte inside realistic battery structures using ultralow-field (ULF) NMR, where spectra are recorded with quantum sensors—atomic optically pumped magnetometers (OPMs) and superconducting quantum interference devices (SQUIDs).

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