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Beyond Lithium Ion Batteries: Higher Energy Density Battery Systems Based on Lithium Metal Anodes

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Abstract: Environmental pollution and energy shortage lead to a continuous demand for battery energy storage systems with a higher energy density. Due to its lowest mass-density among metals, ultra-high theoretical capacity, and the most negative reduction potential, lithium (Li) is regarded as one of the most promising anode materials. Li-sulfur (Li-S) and Li-oxygen (Li-O₂) batteries based on lithium metal anode possess a much higher theoretical energy density in comparison to the present Li-ion batteries. Nevertheless, some severe issues, such as the formation of Li dendrites on the metallic anode, Li polysulfide shuttle effect from the sulfur cathode, and oxygen/moisture erosion from the oxygen cathode, critically hinder their practical

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