Li-NO_2 Battery: NO_2 from Contamination Gas to Energy Storage

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Nitrogen oxides (NO_x) have been regarded as one of the major components of the air pollution and many strategies have been investigated to eliminate this air pollutant. However, they still face many challenges, including high working temperature and pressure, the high cost of catalysts and complex operating processes. Recently, numerous studies have reported that the combination of air pollutants with EES devices is an appealing approach for both controlling environmental pollution and storing energy.[1] Most air pollutants are oxidative, suggesting the possibility of their being recycled in an EES device. Because of their excellent energy density the use of carbon-containing and sulfur-containing air pollutants in EES devices has already been developed.[2] However, the use of nitrogen oxides such as nitrogen dioxide (NO_2) has not yet been reported in a metal-gas battery.

Fortunately, the strong oxidability of NO_2 makes it possible for it to be reduced in a metal-NO_2 system, and this could be of environmental and economic importance. In this study, as a proof-of-concept, we have for the first time demonstrated the room-temperature reduction of NO_2 using a rechargeable lithium-nitrogen dioxide (Li-NO_2) battery. The battery shows a capacity of 884 mAh g^{-1} at 50 mA g^{-1} (666 Wh kg^{-1}) and a promising electrochemical Faraday efficiency of 67%. The unique properties of Li-NO_2 rechargeable batteries not only provide a way to reduce and recycle NO_2 but also highlight the potential of oxidative air pollutants as energy sources for next-generation electrochemical energy storage (EES) systems.

References:

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