universität innsbruck

Innsbruck Physics Colloquium

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How teaching introductory chemistry inspired the invention of superoxide batteries?

Developing low-cost and high-efficiency batteries is vital for adopting renewable but intermittent solar and wind energy. Metal-air batteries are promising candidates due to the inexhaustible supply of oxygen from air and high energy densities. In this talk, I will discuss the redox chemistry of oxygen. Especially, I will tell a story on how my teaching of introductory chemistry help me make the connection between the unusual trend of alkali oxides and metal-oxygen batteries. I recognized the importance of stabilizing superoxide in aprotic oxygen batteries and realized the use of K for achieving the superoxide-based K-air battery. The one-electron K-air battery has elegantly solved the kinetic challenge in oxygen reduction and evolution without using electrocatalysts. Moreover, potassium has advantages in abundance (1.5 wt % in Earth's crust vs. 0.0017 wt % for Li) and fast K+ ion transport kinetics in electrolyte. Therefore, K-air Battery has the great potential of providing a more cost-effective, energy-efficient, non-toxic solution than other existing battery technologies. I will also discuss the current challenges and our recent achievements in solid state K+-ion superionic conductors.

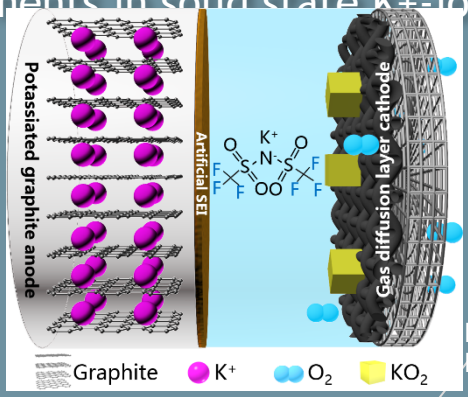

Figure: A schematic structure of a K-ion-Air battery.

Tuesday, 19.01.2021, at 17:15 h online (link t.b.a.)

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