

## **Molecular Trapdoor Mechanism for Selective Gas Adsorption**

The gas separation industry accounts for a considerable fraction of the world's energy consumption, estimated at around 15%. Conventional molecular sieving is highly selective for gas separation but struggles to differentiate between small molecules of similar sizes. In this talk, I will introduce the novel concept of the 'molecular trapdoor' effect, a unique sieving mechanism that isn't reliant on size. This mechanism employs molecular trapdoor adsorbents to selectively permit specific molecules to enter by modulating their interactions with the materials' pore-keeping groups. I will commence with the initial discovery of the 'molecular trapdoor' effect in chabazite zeolites, before discussing its application in LTA zeolites. I will further explore its extension from cage-type zeolites to channel-type zeolites, and finally delve into its demonstration in metal-organic frameworks and how the 'molecular trapdoor' effect can be controlled using an electric field.