

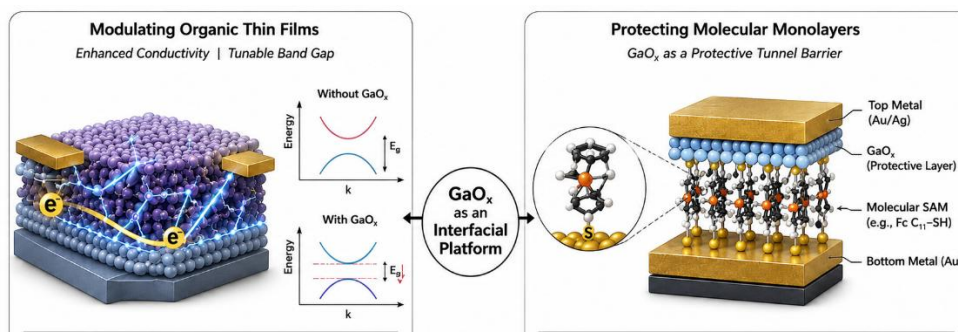
Liquid Metal Oxide-Assisted Organic and Molecular Electronics

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Abstract: Organic and molecular materials offer unique opportunities for controlling charge transport through their electronic structure and molecular-scale interfaces; however, their integration into reliable electronic devices remains challenging due to poor conductivity, interfacial instability, and damage during metal-electrode deposition. Here, we explore **liquid-metal-derived GaO_x as an interfacial platform for organic and molecular electronics**. The incorporation of GaO_x into organic thin-film systems provides an effective approach to modify their electronic properties, including enhanced electrical conductivity and tunable electronic structure, with the potential to regulate the effective band gap and charge-transport pathways. In parallel, we employ GaO_x as a protective and functional interfacial layer for **self-assembled molecular monolayers (SAMs)**, enabling metal-electrode deposition while minimizing direct damage to the molecular layer. The resulting metal/GaO_x/SAM/metal structures provide well-defined **tunneling junctions** in which charge transport can be investigated across molecular interfaces. These two complementary approaches—GaO_x-assisted modulations of organic thin films and GaO_x-mediated protection of molecular monolayers establish a common strategy for overcoming limitations associated with conventional organic and molecular devices. Importantly, they provide a pathway toward probing **molecular-scale electronic effects through experimentally accessible microscopic and macroscopic measurements**, bridging the gap between idealized molecular junctions and practical thin-film devices. This liquid-metal-oxide-assisted approach therefore offers new opportunities for designing, protecting, and interrogating organic and molecular electronic interfaces.



References:

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