

Heterostructures with Integrated Functional Liquids

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Solid-state heterostructures are the cornerstone of modern electronics. To enhance the functionality and performance of integrated circuits, the material space used in the heterostructures is being expanded by an increasing number of compounds and elements of the periodic table. Here we explore solid-state heterostructures with integrated liquids, thus opening a new phase space of materials. Devices containing tens of microscopic capacitors and field-effect transistors have been realized using patterned and integrated NaCl aqueous solutions. The capacitance-voltage characteristics feature unexpected discontinuities, whereas the capacitances and the transfer characteristics of the devices follow and partly exceed the behavior expected for integrated liquids. Our work paves the way to integrated electronic circuits that include highly integrated liquids, thus yielding a wide spectrum of novel research and application opportunities based on microscopic solid/liquid systems.

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