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A Novel Quantum Well of Embedded SrTiO₃ in LaAlO₃ HANGHUI CHEN, ALEXIE KOLPAK, SOHRAB ISMAIL-BEIGI, Department of Physics, Yale University — Inspired by the novel behavior of LaAlO₃/SrTiO₃(001) heterointerfaces, we propose new sets of interfaces in which one TiO₂ or SrO layer is embedded in LaAlO₃. These interfaces can form quantum wells which trap electrons or holes in a single atomic layer of TiO₂ or SrO, respectively, when the “polar catastrophe” occurs. This narrow confinement, in contrast to the situation at the LaAlO₃/SrTiO₃(001) interfaces, sheds light on the still uncertain origin of the charge carriers and provides ideas for engineering their properties. In addition, we study the field effect on these systems to predict the critical external electric field required to induce an insulating-to-metallic transition.

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