Highlights

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Persistent Photoconductivity in 2D Electron Gases at Different Oxide Interfaces

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The transport characterization in the dark and under light irradiation of three different interfaces — LaAlO3/SrTiO3, LaGaO3/SrTiO3, and the novel NdGaO3/SrTiO3 heterostructure — is reported. All of them share a perovskite structure, an insulating nature of the single building blocks, a polar/non-polar character, and a critical thickness of four unit cells for the onset of conductivity.

The interface structure and charge confinement in NdGaO3/SrTiO3 are probed by atomic-scale-resolved electron energy loss spectroscopy showing that, similarly to LaAlO3/SrTiO3, extra electronic charge confined in a sheet of about 1.5 nm in thickness is present at the NdGaO3/SrTiO3 interface. Electric transport measurements performed in the dark and under radiation show remarkable similarities and provide evidence that the persistent perturbation induced by light is an intrinsic peculiar property of the three investigated oxide-based polar/non-polar interfaces. This sets a framework for understanding the previous contrasting results found in the literature about photoconductivity in LaAlO3/SrTiO3 and highlights the connection between the origin of persistent photoconductivity and the origin of conductivity itself. An improved understanding of the photoinduced metastable electron–hole pairs might allow light to be shed directly on the complex physics of this system and on the recently proposed perspectives of oxide interfaces for solar energy conversion.