

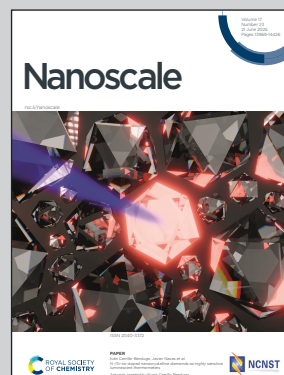
Showcasing work from the group of Professor Woongkyu Lee, Semiconductor Thin-Film Process Laboratory, Soongsil University, Republic of Korea.

Emergence of material-driven two-dimensional electron gas by thermodynamically robust layers in $\text{Al}_2\text{O}_3/\text{In}_2\text{O}_3/\text{Al}_2\text{O}_3$ nanolaminate structures

A two-dimensional electron gas (2DEG) was successfully formed at both Al_2O_3 (AO)/ In_2O_3 (IO) and IO/AO interfaces. At the AO/IO interface, a conventional 2DEG was generated through a reductive-precursor-driven mechanism during fabrication. In contrast, at the IO/AO interface, a material-intrinsic 2DEG was observed, forming independently of fabrication conditions. The results clarify the impact of interface orientation and processing on 2DEG formation. These findings provide insight into interface engineering and suggest directions for developing stable, process-tolerant oxide 2DEG systems for future electronics.

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See Hyun Jae Lee, Woongkyu Lee *et al.*, *Nanoscale*, 2025, **17**, 14118.