

Low-Dimensional Materials for Sensors and Radiation-Hardened Electronics

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Low-dimensional materials—such as graphene, 2D semiconductors, and single-atom catalysts—have gained significant attention for their exceptional potential in next-generation chemical sensing applications. Their inherently high surface-to-volume ratio and highly tunable electronic structures allow for ultra-sensitive molecular detection. However, to fully exploit these unique properties and achieve high selectivity and stability in sensor platforms, strategic functionalization and geometric design are essential.

In addition to these remarkable sensing capabilities, low-dimensional materials demonstrate inherent radiation hardness. This robust behavior originates from their reduced effective volume for radiation-induced defect accumulation, the low atomic number of constituent elements, and the consequently lower interaction probability with incident radiation.

By harnessing the dual benefits of highly sensitive chemical detection and extreme-environment resilience, this presentation introduces novel strategies for the functionalization and fabrication of these materials. Ultimately, we highlight how the tailored design of low-dimensional materials paves the way for robust, next-generation chemical sensor platforms and radiation-hardened electronic systems.

Keywords: gas sensors; low-dimensional materials; functionalization; radiation hardness

References

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