EUROPEAN CONFERENCE ON CHEMISTRY OF TWO-DIMENSIONAL MATERIALS

Low temperature growth of MoS₂ on III-V compound semiconductor

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Abstract

Heterogeneous integration of transition-metal chalcogenides such as MoS₂ on III-V compound semiconductors offers a wide variety of opportunities for developing new optoelectronic devices. In this talk, we present a novel approach for heterogeneous integration of MoS₂ on III-V epitaxial wafers. A thin film of MoS₂ was directly synthesized on a GaN-based epitaxial wafer through the MOCVD technique and fabricated as the TFT array. Subsequently, the MoS₂ based TFT was monolithically integrated with micro-LED devices to produce an active matrix micro-LED display. In addition, we demonstrate a simple approach to obtain red and green colors through the printing of quantum dots on a blue micro-LED, which allows for the scalable fabrication of full-color micro-LED displays. This strategy represents a promising route to attain heterogeneous integration, which is essential for high-performance optoelectronic systems that can incorporate the established semiconductor technology and emerging 2D materials.

References

[1] S. Hwangbo *et al.*, "Wafer-scale monolithic integration of full-colour micro-LED display using MoS2 transistor", *Nature Nanotechnology*, 17, 500 (2022)



Figures

Figure 1: Monolithic integration of MoS2 transistor and GaN-based full-colour micro-LED display