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In-situ Epitaxial Growth of Lateral WS2/WS2xSe2(1-x)/WS2 Multijunctions with 100-fold Photoconductivity[1] YUTSUNG TSAI, ZHAODONG CHU, CHENG FEI, ALEX JOHNSON, DI WU, KEJI LAI, XIAOQIN LI, CHIH-KANG KEN SHIH, University of Texas at Austin, UNIVERSITY OF TEXAS AT AUSTIN, 2DARE TEAM — Conventional semiconductor Heterojunctions (HJ) have played a critical role in advanced electronic and photonic devices. Consequently, after the discovery of atomically thin transition metal dichalcogenides (TMDs), as 2D semiconductors, TMD-based HJs have quickly attracted a lot of attentions. TMD HJ can be formed either vertically (in this sense, similar to conventional HJ but with atomically thin individual layers) or laterally (in this case, to a lower dimension). CVD growth has been shown to be a powerful technique to create lateral HJ. However, to bring the technological potential to another level, multiple heterojunctions (MJ) such as quantum wells will need to be developed. Here, we report a successful in-situ 3-step epitaxial growth of lateral WS2/WS2xSe2(1-x)/WS2 MJ by following suitable growth conditions. Photoluminescence (PL) and Raman characterizations have verified our lateral MJ of the triangular core-ring-ring configuration and indicated the composition x to be 0.85. Unexpectedly, Microwave-impedance-microscopy measurements have extracted the photoconductivity in WS2xSe2(1-x) alloy domain to be 100-fold comparing to the photoconductivity in WS2 domain.

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