

MoS₂ lateral tunnel diode formed by chemical doping

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Abstract

Interlayer band-to-band tunneling in vertical van der Waals heterostructures based on two-dimensional (2D) semiconductors have been intensively studied.^[1-2] Lateral tunnel diode, however, is rarely achieved due to the limitation of doping technique for 2D materials. In this study, we successfully fabricated the first MoS₂ lateral tunnel diode through chemical doping method. Gold chloride (AuCl₃) and benzyl viologen (BV) were used for degenerate p-type doping and n-type doping of MoS₂ flake respectively,^[3] while a masking technique using dielectric layer was used for the separation of n⁺ and p⁺ regions. Negative differential resistance was observed without the applying of additional gate bias. Forward rectifying p-n diode with low reverse bias current and p-n⁺ backward diode with high reverse bias tunneling current can also be achieved by tuning the doping concentration.

References

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