Washington University in St. Louis
Office of Technology Management

CONTROLLING CHARGE DOPING IN 2D MATERIALS

Balgley, Jesse, Henriksen, Erik

Weilbaecher, Craig

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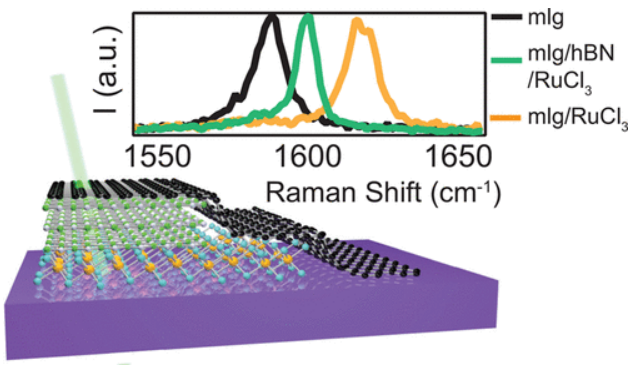
Technology Description

Researchers at Washington University in St. Louis have developed a method to control charge doping in 2D materials like graphene. This method uses α-$RuCl_3$ to create pn junctions at a smaller scale than silicon transistors.

While α-$RuCl_3$ efficiently removes electrons from graphene to create a charge-doped region, the effect can be mitigated by introducing layers of hexagonal boron nitride (hBN) between the two materials. This allows the charge doping to be precisely controlled and spatially-defined.



Stage of Research

The researchers have constructed and extensively tested prototype devices using monolayer graphene, WSe_2 and EuS.

Publications

- Wang Y, Balgley J, Gerber E, Gray M, … Burch KS. (2020). Modulation doping via a two-dimensional atomic crystalline acceptor. *Nano Letters*, 20(12): 8446-8452.

Applications

- Construction of transistors from 2D materials (van der Waals heterostructures)

Key Advantages

- Allows creation of transistors smaller than Si-based
- Applicable to multiple 2D materials: graphene, WSe_2, EuS, etc.

Patents: Pending

Related Web Links: Henriksen Profile & Lab