Replacing Silicon: 2D Semiconductors with a Promising Future

Bowman, Allison

Single atomic layer (2-Dimensional Semiconductor) materials may be fabricated from whole crystals. An example of fabrication is exfoliation of graphene from pyrolytic graphite. Many of these materials have interesting electrical properties to include high conductivity or insulating properties in the planar axis and the potential for n/p doping such as graphene or phosphorene. However there are also some properties that are more troublesome, such as the band gap in these materials being either too large or nonexistent. Therefore binary logic is not replicable in 2D Semiconductors the same way we see it in current silicon based electronics. Recent peer reviewed literature reports investigations of phosphorene as a potential 2D semiconductor used for binary logic. To reproduce results of the literature devices for exfoliation of graphene were developed and applied for phosphorene exfoliation. I report exfoliation of black phosphorous that was reduced to a few atomic layers. Test samples were observed with spectroscopy and microscopy.

Awards Won: