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2 Dimensional Coordination Polymers and Synthesis

Two-Dimensional Coordination Polymers for Enhanced Tunability of Two-Dimensional Materials

Background

Two-dimensional (2D) materials, such as graphene or MoS2, have recently attracted a great deal of attention due to their unique physical and chemical properties. In particular, 2D materials have been explored for applications in energy conversion, optics, photonics, organic electronics, and separation membranes with limited success. In general, most 2D materials consist of homogenous materials, this expedites their production but limits their tunability. To enhance the functionality of 2D materials, a method which maintains ease of production and enhances the tunability or versatility of 2D materials is needed. This would allow materials with desirable physical and chemical properties to be developed more efficiently.

Invention Description

Researchers at ASU have developed a methodology to enhance the tunability of 2D materials by using a versatile array of 2D coordinating polymers and metals. The synthetic methodology relies on the synthesis of several benzene-based-building-blocks (B4). The synthetic methodology used to produce the B4 utilizes straightforward synthetic techniques as well as commercially available chemicals. Each of the B4 are capable of binding metals and the addition of metal salts results in the formation of sheet-like metal organic polymers. Excitingly, calculations suggest that these materials could be used as infrared based semiconductors and early experimental evidence shows that these materials can be highly luminescent. The extensive diversity of metal supports and B4 suggests that these sheet-like polymers may have chemical and physical properties that may be able to address issues in energy conversion, organic electronics, separation systems, and catalysis.

Potential Applications

- Semiconductors
- Organic Electronics
- Solar Cells
- Separation Membranes
- Catalysis

Benefits and Advantages

- Tunable – The primary advantage that these B4 possess is that they are highly tunable. By exchanging or varying the ratio of different B4 or metals

the thermal, electrical, or optical properties of these materials will change dramatically.

- Elegant – The synthetic methodology is straightforward and does not require sophisticated equipment nor exotic chemicals.
- Versatile – Because the methodology relies on the use of the same B4 the same basic materials can be used to approach a variety of technological issues.

Professor Green's Website

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