



## Physical Sciences Seminar

# Synthesis and Characterization of $\gamma$ -Graphyne, a Novel Allotrope of Carbon

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Host: Rafal Klajn

The unique ability of carbon to bond with itself forming extended chains and networks underlies the structural complexity of organic matter. This complexity extends to elemental carbon. Several hundred crystalline carbon phases have been theoretically predicted to date. However, few of these materials have been realized experimentally. Advances in the synthesis of nonbenzenoid and  $sp^1$ -containing allotropes have been especially limited. One of such allotropes is  $\gamma$ -graphyne, an  $sp^2/sp^1$  carbon lattice which can be viewed as graphene uniformly expanded through insertion of two-carbon acetylenic units.  $\gamma$ -Graphene is predicted to be a semiconductor with a moderate band gap, ultrafast charge carrier mobility comparable to that of graphene, and high thermal conductivity. Recently our group reported the synthesis of multilayer  $\gamma$ -graphyne through crystallization-assisted irreversible polymerization. While conventional 2D polymerizations and reticular chemistry rely on error correction through reversibility, we demonstrated that a covalent lattice of high quality can be synthesized under purely kinetic control. Initial experiments indicate that  $\gamma$ -graphyne is a semiconductor with a bandgap of  $\sim 0.5$  eV. The crystal structure features aperiodic sheet stacking with an interlayer distance of 3.48 Å. The material is thermally stable up to 240 °C but undergoes a rapid photochemical transformation under green or longer-wavelength light. In this presentation, I shall discuss our recent progress in exploring the physical and chemical properties of this novel form of carbon.

**Tuesday, November 14, 2023 11:00am - 12:00pm**

Sunstone Building - Big Seminar Room B



This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station.

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