Ben-Gurion University of the Negev
אוניברסיטת בן-גוריון בנגב

Graduate Students Seminar

Department of Chemistry

Sunday, May 14th, 2023
Time 14:30
Bldg. 43 Room 015

Adi Azoulay

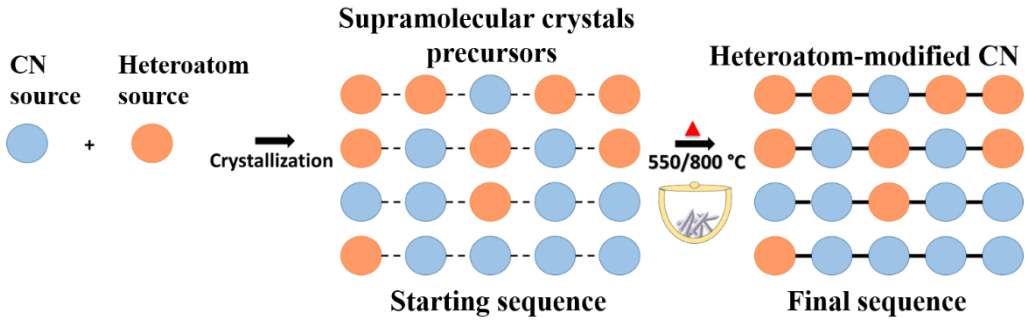
Under the supervision of Prof. Menny Shalom

Synthesis of lightweight carbon-nitrogen-phosphorus materials with controlled structural and physical properties

Metal-free based polymers have gained considerable attention recently due to their low cost and potential energy-related applications, including water splitting, photo- and electrocatalysis, CO2 reduction, etc. The insertion of heteroatoms with different electronegativity into a carbon network can greatly tune its optical, physical, electronic, and thermal properties, ranging from semimetal-like properties, semiconductors to insulators. The introduction of nitrogen that serve as electron donor and phosphorus as electron acceptor into a carbon structure will alter its electronic states and oxidation resistance at high temperatures. One classic route to synthesize heteroatom modified carbon-nitrogen (CN) materials is via solid-state approach (pyrolysis of pristine solid monomers at high temperatures). Despite the impressive wide range of materials synthesized by this method, some drawbacks still limit the .progress in this field

During my Ph.D., we developed a new, scalable, and easy method to synthesize heteroatom-incorporated CN materials using supramolecular crystalline precursors.

The new synthetic tool allows the fine-tuning of the materials' properties and controllable elemental composition, toward the development of a wide variety of targeted materials ranging from phosphorus rich-CN to phosphorous and nitrogen-doped carbon. These materials show remarkable thermal stability and promising performance in high temperature heterogeneous catalysis while illustrating the structure-activity relations. The supramolecular approach also enables engineering chirality features from the precursor level to the final CN toward their potential integration in enantioselective reactions.



References :

[1] A. Azoulay, A. Garcia Baldovi, J. Albero, N. Azaria, J. Tzadikov, A. Tashakory, N. Karjule, S. Hayun, H. García, M. Shalom, ACS Appl. Energy Mater. 2023, 6, 439–446.

[2] A. Azoulay, J. Barrio, J. Tzadikov, M. Volokh, J. Albero, C. Gervais, P. Amo-Ochoa, H. García, F. Zamora, M. Shalom, J. Mater. Chem. A 2020, 8, 8752–8760.