NCN OPUS
Spin Frustration in Molecular Nanocarbons

Principal Investigator: Marcin Stępień, Faculty of Chemistry, University of Wrocław, Poland

In this project we will develop triangular and polyhedral organic nanocarbons that host stable radical centers and impose equal antiferromagnetic interactions between all spins. These rigid π-conjugated frameworks are designed to stabilize highly degenerate, fluctuating ground states, bringing spin frustration from metal-based solids into the realm of π-conjugated organics. We will explore a progression from minimalist triradicals to more complex oligoradicals and redox-switchable assemblies, enabling both topology-encoded and electrochemically induced frustration within a single platform. The work will clarify how non-benzenoid motifs and spatial symmetry govern magnetic competition and how redox chemistry can toggle frustrated states on demand. The resulting molecules and crystals will provide model systems for correlated magnetism and potential starting points for future, sustainable quantum materials.

LEAD PAPER

A. Borissov, P. J. Chmielewski, A. C. Valdivia, C. J. G. García, J. Casado, M. Stępień, *Triindenotriphenylenes: Spin-Frustrated Triskelion Triradicals with Excellent Ambient Stability. Angew. Chem. Int. Ed.* **2024**, *63*, e202408510.

UP TO FIVE STUDENT POSITIONS

Up to 48 months each. Tax-exempt scholarship: 2 500 PLN/month (PhD students, 3 positions), 1 250 PLN/month (undergraduates, 2 positions). Earliest start date: January 2026.

Tasks: synthesis, spectroscopy, data analysis

Requirements:

1. PhD students
    a. Experience in multistep organic synthesis, including microscale and inert-atmosphere techniques.
    b. Familiarity with aromatic and functional dye chemistry.
    c. Proficiency in spectroscopic methods, especially NMR.
    d. Enrollment in the PhD program at the Faculty of Chemistry UWr
2. Undergraduate students
    a. Demonstrated aptitude in experimental organic chemistry and fundamental spectroscopic analysis, as evidenced by strong performance in relevant laboratory and lecture courses.
    b. Enrollment in the BSc/MSc program at the Faculty of Chemistry UWr.
3. Fluency in English.
4. Not employed as an investigator in other funded research projects.

Apply online at https://forms.gle/XVHgPDfJM2mv4PKS7
Deadline: 2025-12-21 23:59

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