



The Place where Innovation Starts



"Empa offers good employment conditions and supports equal opportunities. I consider this very important."

Irene Ferretto, Advanced Materials Processing

PhD position on Structure Property Investigations of Phosphorus based Covalent Adaptable Networks

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Materials science and technology are our passion. With our cutting-edge research, Empa's around 1,100 employees make essential contributions to the well-being of society for a future worth living. Empa is a research institution of the ETH Domain.

Crosslinked polymers (e.g. thermosets) represent an important class of high-performance materials used in applications like transportation or sustainable energy production. In this PhD project, you will explore the fundamental mechanisms that will enable the development of more sustainable thermosets containing dynamic crosslinks in the future.

We are a Chemistry group at Empa with high scientific excellence that has recently developed novel covalent adaptable networks (CANs) based on phosphorus chemistry, thereby enabling fire protection and recyclability of polymers in a unified solution. This interdisciplinary project involves polymer chemistry and physics and is funded by the Swiss National Science Foundation (SNSF). It is also in collaboration with the University of Ghent. The scientific questions addressed in this project shall help to understand the local covalent and non-covalent mechanisms in CANs and correlate them to the macroscopic properties that will later be relevant for technical application.

Your tasks

The PhD work will involve:

- Synthesizing phosphorus-containing network polymers based on phosphonate and phosphoramidate chemistry.
- Detailed rheological, thermal, mechanical and fire performance analysis of these CANs.
- Molecular structural characterization of the CANs with Solid-State NMR, X-ray analytics, Raman, AFM, etc., and relating the features to the properties.
- Collaborate with project partners internally (Empa) and externally (UGent).
- Present project results at conferences and publish them in scientific journals.

Your profile

We are seeking a highly motivated and enthusiastic candidate with a strong organic and polymer chemistry background who wants to bridge fundamental knowledge in polymer chemistry and physics to real-world applications. A completed Master's degree in polymer / organic chemistry is mandatory. Hands-on experience in organic and polymer synthesis is a must. Prior experience in the rheology and X-ray characterization of polymers is highly desirable. Self-driven curiosity and strong observational skills during experimentation are also highly desirable. Fluency in both verbal and written English is required. Knowledge of the German language will be an added benefit.

Our offer

The Advanced Fibers Laboratory is in St Gallen and comprises team members who are experts in Chemistry, Physics and Engineering. The chemistry group in the laboratory is fully equipped with the necessary infrastructure (synthesis, thermal, fire, mechanical and structure) to perform the project. The duration of PhD position is envisioned to be 3-4 years. The PhD student will be registered in the Department of Materials at ETH and supervised by Prof. Dr. Manfred Heuberger (PhD Promoter), Dr. Sabyasachi Gaan (Principal Investigator and co-supervisor) and Dr. Edith Perret (co-supervisor). The desired starting date is the 1st of March 2025 or upon mutual Agreement.

We live a culture of inclusion and respect. We welcome all people who are interested in innovative, sustainable and meaningful activities - that's what counts.

We look forward to receiving your complete online application including a letter of motivation, CV, certificates, diplomas and contact details of two reference persons. Please submit these exclusively via our job portal. Applications by e-mail and by post will not be considered.

Sarah Stüdl, Bereichspersonalleiterin / HR Partner

Your future place of work

Empa
Lerchenfeldstrasse 5
9014 St. Gallen









Questions?

✉ [Dr Sabyasachi Gaan](#)
Group Leader
Advanced Fibers

<https://www.empa.ch/web/s402/overview>



Empa as an employer

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|  <p>Innovative, sustainable, meaningful activities</p> |  <p>Creating added value for society</p> |
|  <p>International, multicultural working environment</p> |  <p>Freedom to create and develop</p> |
|  <p>Culture of inclusion and respect</p> |  <p>Excellent balance between different areas of life</p> |
|  <p>Multiple award-winning and certified employer</p> |  <p>Benefits for rail, mobile, childcare, catering, etc.</p> |

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