



## PhD Program between the Freie Universität Berlin (FUB) and the China Scholarship Council (CSC)

**Open PhD Position at Freie Universität Berlin,  
offered only to Chinese CSC scholarship candidates 2024**

**Department/Institute:** Department of Chemistry and Biochemistry, Section for inorganic Chemistry

**Subject area:** Polymer synthesis and polymerisation catalysis

**Name of Supervisor:** Alex Plajer

**Number of open PhD positions:** One position

**Type of the PhD Study:** Full-time

**Project title:** Sustainable polymeric material with main group rich backbones

### **PhD Project description:**

Alternating ring-opening copolymerisation (ROCOP) is a highly modular polymerisation methodology which offers straightforward access to polymer structures which are not easily accessible otherwise. Commonly, transition metal-based catalysts are used to copolymerise oxygenated monomers such as epoxides and CO<sub>2</sub>. Although main group (metal) catalysts are an attractive alternative due to their low toxicity, cost and colourlessness, their overall catalytic performance is still lacking behind the leading transition metal systems. Moving towards main group (metal) catalysts could be particularly important when turning to heavier main-group monomers in order to avoid catalyst poisoning and facilitate polymer purification. However, incorporating main group elements such as sulphur or phosphorus into polymers already shows promise in their application as high refractive index polymers, polymeric electrodes as well as flame retardant materials and might even lead to more facile degradation. Recently our group reported a series of high-impact works (*Nat. Commun.* 2023; *Cell. Rep. Phys. Sci.* 2023; *Chem. Sci.* 2022) achieving the copolymerisation of sulfur rich monomer into selective sequences with added property and degradability benefits over all-oxygen polymers.

The aim of your Ph.D. is to design and investigate multifunctional catalysts based on cheap, non-toxic and colourless main-group elements for the synthesis of degradable and recyclable main group polymers.

Having developed new catalysts and polymerisations you will then use multiple polymers in blockpolymer materials to rationally combine the material properties tailored to the application (e.g. use as elastomers or adhesives). Importantly those will feature main group rich blocks leading to exciting material properties such as

improved degradability compared to oxygenated analogues or the ability to coordinate transition metals which the main group centres will impart on the entire material. Finally, the intrinsic polymer structures will allow the design of circular chemical recycling pathways to achieve de- and re-polymerisation after application. The project addresses important topical issues such as catalysis, the translation of main group into materials chemistry as well as the design of degradable and chemically recyclable functional materials. You will be trained in a wide range of different topics highly relevant to future academia and industry preparing you for a successful career in both.

Further reading: [www.agplajer.com/publications](http://www.agplajer.com/publications)

**Language requirements:**

IELTS: 6,5 oder TOEFL: 95 ibt.

**Academic requirements:**

M.Sc. or equivalent degree in Chemistry is required. Experience with air-sensitive techniques is beneficial. Experience in the synthesis and characterization of molecular main-group or metal containing compounds as well as polymer synthesis and characterization (NMR, MS GPC, DSC, DMA, tensile test, etc.) is beneficial.

**Information of the professor or research group leader (website, awards etc.):**

[www.agplajer.com](http://www.agplajer.com)

**Please Note:** In a first step, the complete application should be uploaded to the [online portal](https://fuberlin.moveon4.de/form/60acfece5d328710e40bdbd5/eng) (<https://fuberlin.moveon4.de/form/60acfece5d328710e40bdbd5/eng>) for evaluation by January 15th, 2024. Please do not contact the professor before. He/she will get in contact with you after having received the complete application via the International Office of Freie Universität Berlin in January.