



2023 Helmholtz – OCPC – Programme for the involvement of postdocs in bilateral collaboration projects

PART A

Title of the project:

Brackish water desalination with electrodialysis and membrane distillation

Helmholtz Centre and/or institute:

Karlsruhe Institute of Technology (KIT)

Project leader:

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Description of the project (max. 1 page):

Several postdoc opportunities are available that build on ongoing research projects in the area of Photo- and electrocatalytic Membrane Reactors (PMR, EMR) for the removal of micropollutants during water treatment and reuse. Projects span from materials characterization through to process upscale depending on the individual skills and interests of the applicant. On the materials side, the main aim is to fabricate a photo- and electrocatalytic membranes and investigate these systematically using common operational and water quality parameters for the removal of micropollutants such as steroid hormones in the nanogram per litre concentration range. On the process side the design and constuction of a plot system with a innovative photocatalytic membrane module is a key challenge – followed by field testing.

This research expands from ongoing projects in the area of renewable energy powered membrane processes, in particular solar powered hybrid ultra- and nanofiltration at IAMT. The removal of inorganic contaminants such as nitrate, arsenic, selenium, uranium and fluoride is a key priority. The projects explore aspects that range from system adaptation to fluctuations in solar energy that results in a non-steady state operation and variation in contaminant retention to dealing with concentrates by coupling with membrane distillation.

The research will include i) operation of novel continuous electrodialysis system with fluctuating energy, ii) examination of water contaminants in brackish water treatment, iii) design and construct a membrane distillation component for concentrate recovery, iv) resource mass balance, and v) organise and conduct national and international field work. Many aspects of this project require in-depth research and development, including;

- ◆ Feasibility studies on removal of contaminants in a solar powered electrodialysis and/or membrane distillation process
- ◆ Establishment of the most suitable energy management scenario in collaboration with the renewable energy colleagues at KIT-IMT
- ◆ Elucidate the dominant separation mechanisms such that both fundamental understanding and optimized process performance can be achieved in electrodialysis and membrane distillation

Throughout the project, there will be multiple opportunities for cooperation with internal and external partners. The choice of collaboration partners and field trip destinations is open. Significant experience in working with different African countries exists in the team, while mobile Landrover - Trailer units will enable working in geographically closer destinations.

Co-supervising PhD and supervising master students, giving oral presentations at conferences, writing high-impact journal articles, as well as sharing your knowledge via (a minimal amount of) teaching. Career development through many team activities is an opportunity to attain leadership skills and prepare for exciting professional opportunities in industry or academia.



Description of existing or sought Chinese collaboration partner institute (max. half page):

IAMT is open to new collaborations from within China with a focus on membrane technology.

Required qualification of the postdoc:

The ideal candidate will hold a PhD in Chemical, Process, Environmental, Materials Engineering, or equivalent and is a naturally curious 'can do' person, eager to learn more and has a strong interest in research. Experience with membrane filtration is a requirement and experience with electrodialysis of membrane distillation systems (of any scale) a definite advantage. Further requirements are experience in specifying system components, sound experimental problem solving skills, trace ion/water analysis and a solid publication track record – as well as a good common sense. Excellent English language proficiency is essential (IAMT is English speaking), basic German language skills of advantage. A valid driver's licence is required.



Please send applications with cover letter addressing position requirements, CV, publication list and your contribution to the publication (if relevant), academic transcripts, degree certificates, contact details for three references and a preliminary research proposal on the topic to the above contact(s). It is strongly advised to visit the IAMT website as well as read the numerous publications on the topic.