HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

Helmholtz Call for Chinese Applicants Interested in Running for CSC 2021 Fellowship

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Institute of Energy and Climate Research, Materials Synthesis and Processing (IEK-1)
https://fz-juelich.de/iek/iek-1/EN/Home/home_node.html

Supervising scientist: Prof. Olivier Guillon, Dr. Qianli Ma

University for registration or for a future degree: RWTH Aachen University

Research Field: Cathode materials for all-solid-state-sodium battery

Position open for: **PhD Student** √ **Sandwich PhD Student** □

Title of the research: Low-cost and fully environment-friendly cathode materials for stationary all-solid-state-sodium batteries

More description of research topic:

Huge demands of the current and future Li-ion battery (LIB) market raised the concerns about the resource availability of lithium and hence of future cost of lithium-containing materials, and therefore bring opportunities to the development of Na-ion batteries (NIBs), especially in stationary applications like electrical energy storage devices for fluctuating renewable power technologies, e.g. solar and wind energy. Like their Li counterpart which employ solid inorganic electrolytes rather than liquid organic electrolytes, NIBs in all-solid-state design (ASSNB) are regarded as the batteries of the next generation because of their safe design and adaptability to temperature changes.
In the Institute of Energy and Climate Research, Forschungszentrum Jülich (FZJ-IEK1), room-temperature ASSNBs have been successfully prepared with high area capacity, low degradation and high dendrite tolerance. The cells are applied $Na_3V_2(PO_4)_3$ (NVP) as cathode, NaSICON $Na_3Zr_2(SiO_4)_2(PO_4)$ as electrolyte and Na-metal as anode. Since vanadium is the most expensive and the only toxic element in the whole cells, it is important to exchange vanadium through cheaper and non-toxic iron and develop a low-cost and fully environment-friendly cathode material. The task of the applicant is to develop such cathode materials which have high specific capacity, low interface-resistance with electrolyte and good operating stability. Full cells will also be fabricated for testing during his/her study. The researches will mainly focus on the fundamentals, i.e. on the Technology Readiness Levels (TRLs) of 1 – 3, and aim to future application of stationary energy storage devices. The duration of the Ph.D. period will be 4 years.

Specific requirements:

The applicant should have master's degree in materials science, chemistry, physics or related area, with very good performance in bachelor and master period. Knowledge of inorganic material synthesis and processing, microstructure design and electrochemistry is encouraged. The applicant should also have good English skills with German as a plus.

Working Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2021

Language Requirement: Very good knowledge of English language, written and spoken. German language courses are organised in the context of our in-house training program and are free of charge.

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