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**Chair of Inorganic Active Materials for
Electrochemical Energy Storage**

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The University of Bayreuth is a research-oriented university with internationally competitive and interdisciplinary profile fields in research and teaching. At the chair of Inorganic Active Materials for Electrochemical Energy Storage (Prof. Dr. Matteo Bianchini) the following temporary position is available, starting in **October 2026** or soon thereafter:

PhD student (m/f/d)

German salary scale TV-L E13 (67%)

Topic: Fe-Based Layered Oxides from Na/Li Ion Exchange for Sustainable Li-Ion Batteries

We are looking for an excellent PhD student (m/f/d) to integrate our group at the Bavarian Center for Battery Technology (BayBatt, University of Bayreuth).

Your tasks:

The project is focused on the development and understanding of Fe- and Mn-based layered cathode materials for Li-ion batteries obtained through Na/Li ion exchange reactions. The project aims to prepare and investigate O2-type layered oxides obtained from P2-type sodium precursors, with the ultimate goal of stabilizing metastable polymorphs that cannot be accessed through conventional synthesis routes. We will pioneer the combined computational and experimental investigation of Fe-containing O2-type layered Li oxides, addressing a critical gap in the current literature while contributing to the broader goal of reducing reliance on Co- and Ni-based battery technologies.

In particular, we seek to develop a fundamental understanding of the ion exchange process and of the parameters governing successful Na/Li exchange reactions, especially concerning phase purity, structural defects, and faulting mechanisms. The project combines experimental materials chemistry with state-of-the-art computational modelling and addresses a key challenge in the development of sustainable battery materials based on earth-abundant elements.

The computational part of the project will be carried out in collaboration with the team of Dr. Sicolo and Prof. Albe at TU Darmstadt. Experimentally, the project is carried out at UBT and your tasks will involve the synthesis and characterization of layered oxide materials using advanced structural, spectroscopic, and electrochemical techniques.

Your profile:

PhD student (m/f/d) with a Master's or Diploma degree with a background in inorganic chemistry, physical chemistry, materials science or related disciplines are particularly encouraged to apply. Experience in battery materials, solid-state chemistry, crystallography, or computational modelling is advantageous but not required. The aim is to build a diverse and inclusive research group, hence open-minded and free-thinking individuals are welcome. The initial contract is for 1 years with the prospect for further extension (+2).

The University of Bayreuth values the diversity of its employees and is expressly committed to the goal of gender equality. Women are strongly encouraged to apply. Applicants with children are very welcome. The University of Bayreuth is a member of the Best Practice Network "Familie in der Hochschule e.V.", and has successfully participated in the HRK audit "Internationalization of the University". Persons with severe disabilities will be given preferential consideration if equally qualified.

Your application:

Please apply **online** with your CV, BsC/MsC transcripts and cover letter specific to this position **by 30th August 2026** using the keyword "**Ion exchange**" EXCLUSIVELY via the **application portal** of the University of Bayreuth <https://www.uni-bayreuth.de/en/job-vacancies#Research>. The documents will be deleted in accordance with data protection requirements once the position has been filled.

For further information about the position, about our group or about the chair, please contact **Prof. Dr. Matteo Bianchini** (matteo.bianchini@uni-bayreuth.de, phone: +49 921 55-4380) or visit www.bianchini.uni-bayreuth.de.

Italian, French, German descriptions of the project in the following

ITALIANO.

Il progetto è incentrato sullo sviluppo e sulla comprensione dei materiali catodici a struttura stratificata a base di Fe e Mn per batterie agli ioni di litio, ottenuti tramite reazioni di scambio ionico Na/Li. Il progetto mira a preparare e studiare ossidi a struttura stratificata di tipo O2 ottenuti da precursori di sodio di tipo P2, con l'obiettivo finale di stabilizzare polimorfi metastabili che non sono accessibili tramite percorsi di sintesi convenzionali. Saremo pionieri nell'indagine combinata, computazionale e sperimentale, degli ossidi di litio a struttura stratificata di tipo O2 contenenti ferro, colmando una lacuna critica nella letteratura attuale e contribuendo al più ampio obiettivo di ridurre la dipendenza dalle tecnologie delle batterie a base di cobalto e nichel.

In particolare, intendiamo sviluppare una comprensione fondamentale del processo di scambio ionico e dei parametri che regolano il successo delle reazioni di scambio Na/Li, con particolare riferimento alla purezza di fase, ai difetti strutturali e ai meccanismi di stacking faults. Il progetto combina la chimica sperimentale dei materiali con il modelling computazionale all'avanguardia e affronta una sfida chiave nello sviluppo di materiali sostenibili per batterie basati su elementi abbondanti in natura.

La parte computazionale del progetto sarà svolta in collaborazione con il team del dott. Sicolo e del prof. Albe presso la TU Darmstadt. Dal punto di vista sperimentale, il progetto si svolgerà presso l'università di Bayreuth e i tuoi compiti comprenderanno la sintesi e la caratterizzazione di materiali a ossidi stratificati utilizzando tecniche strutturali, spettroscopiche ed elettrochimiche avanzate.

FRANÇAIS.

Ce projet est axé sur le développement et la compréhension de matériaux cathodiques en couches à base de fer (Fe) et de manganèse (Mn) destinés aux batteries lithium-ion, obtenus par des réactions d'échange d'ions Na/Li. Il vise à préparer et à étudier des oxydes en couches de type O2 issus de précurseurs sodiques de type P2, dans le but ultime de stabiliser des polymorphes métastables inaccessibles par les voies de synthèse conventionnelles. Nous serons les premiers à mener une étude combinée, à la fois computationnelle et expérimentale, sur les oxydes de lithium en couches de type O2, contenant du fer, comblant ainsi une lacune majeure dans la littérature actuelle tout en contribuant à l'objectif plus large de réduire la dépendance vis-à-vis des technologies de batteries à base de cobalt et de nickel.

Nous cherchons en particulier à acquérir une compréhension fondamentale du processus d'échange ionique et des paramètres régissant la réussite des réactions d'échange Na/Li, notamment en ce qui concerne la pureté de phase, les défauts structuraux et les mécanismes de stacking faults. Le projet associe la chimie expérimentale des matériaux à une modélisation numérique de pointe et s'attaque à un défi majeur dans le développement de matériaux de batterie durables à base d'éléments abondants sur Terre.

La partie computationnelle du projet sera menée en collaboration avec l'équipe du Dr Sicolo et du professeur Albe à l'Université technique de Darmstadt. Sur le plan expérimental, le projet est mené in Bayreuth et vos missions porteront sur la synthèse et la caractérisation de matériaux oxydes en couches à l'aide de techniques avancées de caractérisation structurale, spectroscopique et électrochimique.

DEUTSCH

Im Fokus des Projekts stehen die Entwicklung und das Verständnis von Fe- und Mn-basierten Schichtkathodenmaterialien für Lithium-Ionen-Batterien, die durch Na/Li-Ionenaustauschreaktionen gewonnen werden. Ziel des Projekts ist die Herstellung und Untersuchung von O2-Typ-Schichtoxiden, die aus P2-Typ-Natrium-Vorläufern gewonnen werden, mit dem letztendlichen Ziel, metastabile Polymorphe zu stabilisieren, die über herkömmliche Synthesewege nicht zugänglich sind. Wir werden Pionierarbeit bei der kombinierten computergestützten und experimentellen Untersuchung von eisenhaltigen O2-Typ-Schicht-Li-Oxiden leisten, wodurch wir eine kritische Lücke in der aktuellen Literatur schließen und gleichzeitig zum übergeordneten Ziel beitragen, die Abhängigkeit von Batterie-Technologien auf Co- und Ni-Basis zu verringern.

Insbesondere streben wir ein grundlegendes Verständnis des Ionenaustauschprozesses und der Parameter an, die erfolgreiche Na/Li-Austauschreaktionen bestimmen, insbesondere hinsichtlich Phasenreinheit, Strukturdefekten und Stacking faults. Das Projekt verbindet experimentelle Materialchemie mit modernster computergestützter Modellierung und befasst sich mit einer zentralen Herausforderung bei der Entwicklung nachhaltiger Batteriematerialien auf der Basis von in der Erde reichlich vorhandenen Elementen.

Der rechnergestützte Teil des Projekts wird in Zusammenarbeit mit dem Team von Dr. Sicolo und Prof. Albe an der TU Darmstadt durchgeführt. Experimentell wird das Projekt in Bayreuth durchgeführt, und Ihre Aufgaben umfassen die Synthese und Charakterisierung von Schichtoxidmaterialien unter Verwendung fortschrittlicher struktureller, spektroskopischer und elektrochemischer Techniken.