Universität Stuttgart

Institut für Materialwissenschaft

Universität Stuttgart • IMW • Abteilung Chemische Materialsynthese
Heisenbergstraße 3 • 70569 Stuttgart

Abteilung
Chemische Materialsynthese

Abteilungsleiter

Prof. Dr. Oliver Clemens

Kontakt
Heisenbergstraße 3
70569 Stuttgart
T 0711 685-61932

E-Mail:
oliver.clemens@imw.uni-stuttgart.de

Montag, 10. Januar

Joint Practical Skills Course and Master Thesis on Potential New Superconductors

Topochemical reductions can lead to materials with unusual oxidation states. Our previous work has focused on the preparation of low-valent nickel compounds [1-3]. The characterization of their magnetic properties however is impeded from the existence of small amounts of magnetic compounds as impurity phases as well as the difficulty in obtaining the material in a dense form, making characterization via magnetometry or conductivity measurements difficult.

Transitions to the superconducting state are usually accompanied by smaller changes in bond characteristics, which can be monitored with IR, Raman and optical spectroscopy techniques [4]. So far, temperature dependent spectroscopy studies have obtained little attention for topochemically reduced compounds. In this project, the student will focus on using topochemical defluorination methods for the preparation of already existing and novel reduced oxyfluorides, and characterize them in co-operation with the group of Prof. Dr. Dressel, Physikalisches Institut 1, University of Stuttgart, for their temperature-dependent optical properties.

Webpage of Prof. Dressel:
https://www.pi1.uni-stuttgart.de/institute/

References:
1. Wissel, K.; Heldt, J.; Groszewicz, P. B.; Dasgupta, S.; Breitzke, H.; Donzelli, M.; Waidha, A. I.; Fortes, A. D.; Rohrer, J.; Slater, P. R.; Buntkowsky, G.; Clemens, O., Topochemical Fluorination of La_2NiO_{4+d}: Unprecedented Ordering of Oxide and Fluoride Ions in $La_2NiO_3F_2$. *Inorganic Chemistry* **2018,** 57, (11), 6549-6560.
2. Wissel, K.; Malik, A. M.; Vasala, S.; Plana-Ruiz, S.; Kolb, U.; Slater, P. R.; da Silva, I.; Alff, L.; Rohrer, J.; Clemens, O., Topochemical reduction of $La_2NiO_3F_2$: the first Ni-based Ruddlesden-Popper n = 1 T′-type structure and the impact of reduction on magnetic ordering. *Chemistry of Materials* **2020,** 32, (7), 3160-3179.
3. Wissel, K.; Schoch, R.; Vogel, T.; Donzelli, M.; Matveeva, G.; Kolb, U.; Bauer, M.; Slater, P. R.; Clemens, O., Electrochemical Reduction and Oxidation of Ruddlesden–Popper-Type La2NiO3F2 within Fluoride-Ion Batteries. *Chemistry of Materials* **2021,** 33, (2), 499-512.
4. Dressel, M., Electrodynamics of Metallic Superconductors. *Adv Cond Matter Phys* **2013,** 2013, 1-25.