Masters opportunity in Materials Science

Commencing WiSe 2019 or SoSe 2020

Synthesis and characterisation of low-band gap silicates of $Na(Mn,Fe)Si_2O_6$

Background

Silicates constitute the most common component of the earth's crust. While silicates are most commonly studied within the field of geology, there is increasing interest in the novel synthesis of functional silicate ceramics, as the result of the wide diversity of structures and compositions that can be obtained.

Recent studies suggested that nanocrystalline sodic pyroxenes may exhibit multiferroic, catalytic and semiconducting behaviour, which is generally unusual for silicates. Through appropriate fabrication methods these materials are promising towards environmental and energy applications. In this project we will further explore the functionality of sodic pyroxenes by conducting an in-depth investigation of the synthesis of these materials using sol-gel and hydrothermal methods.

Project

The fabrication of thin films of Namansillite ($NaMnSi_2O_6$) and Aegerine ($NaFeSi_2O_6$) and nanocrystalline powders by sol-gel and hydrothermal methods respectively will be conducted by adapting reported protocols reported in the literature. We will establish the optimal methods for the preparation of single phase materials. The subsequent band gap of these materials will be characterized to determine whether predicted semiconductor behaviour can be obtained, and the role of morphology and composition will be investigated. Through a collaboration within TU Berlin the effectiveness of semiconducting sodic pyroxenes developed in this work will be investigated in catalysed reactions including hydrogen generation by water splitting, CO_2 reduction and the degradation of organic dyes in water.

Contact:

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