OTTO VON GUERICKE UNIVERSITÄT MAGDEBURG | VST | FAKULTÄT FÜR VERFAHRENS- UND SYSTEMTECHNIK

Topic for a Master Thesis (or Bachelor Thesis)
for students enrolled in CiW, VT, WVET, UEPT, BSYT, CEE

CHEMISCHES INSTITUT
Lehrstuhl für Technische Chemie
INSTITUT FÜR VERFAHRENSTECHNIK
Lehrstuhl für Thermische Verfahrenstechnik

Dr. Alexandra Lieb

Project at the Chair of Industrial Chemistry

Topic: „Investigation of the thermal storage capacity of salt impregnated MOF granules (materials with joint absorptive and adsorptive heat storage capability)“

The class of metal organic framework materials (so-called MOFs) is currently in the focus of word wide scientific investigation. In this concern, for example gas storage and separation, catalysis, drug release, dehumidification and sorptive cooling / sorptive heat storage are interesting areas of research.

A widely discussed microporous MOF material is CAU-10-H (an aluminium isophthalate). It is stable against water and shows attractive water adsorption characteristics, especially regarding sorptive cooling applications but also sorptive heat storage and water harvesting from air.

Heat storage can be performed in different ways, and three main types are differentiated, i. e. sensible, latent and chemical heat storage. Chemical heat storage is further divided in sub-groups, and absorptive and adsorptive heat storage are amongst them. The **ab**sorptive storage function can be realised using salt solutions (like in commercially available absorptive heat storage devices). Alternatively also solid salts could be used (hydration/dehydration within the crystal), but the crucial fact in that case is the agglomeration of the crystals, which diminishes the hydration kinetics and destroys cycle stability of the materials. Heat storage based on **ad**sorption functionalises the physisorption of suitable molecules (usually H_2O) at the surface of a porous material.

CAU-10-H is synthesised in large amounts (500 g per batch) at the chair of Industrial Chemistry using a “green synthesis route” and shaped into beads with a binder-based procedure. Such beads are very good host materials for salt solution impregnation. The fabricated composite materials show interesting heat storage properties, which was elucidated by two Master Theses. Up to now, the impregnation was performed using $CaCl_2$ and $MgSO_4$ solutions and the heat storage capacity of the functional materials was characterised with a custom-made test stand (named SWTS) at the chair of Industrial Chemistry.

Within the Thesis work, you will perform a comparative study of the already established materials and an additional composite material, which you fabricated in a similar way (by impregnation of CAU-10-H granules with a salt solution). The salt for the novel salt/MOF composite material will be your selection based on an extensive literature search. In addition to the testing at the SWTS other analytical methods will be used, i. e. sorption methods (N_2, H_2O), SEM, XRD, Hg intrusion and TG-DSC, which could be partially performed by yourself. The performed study should become part of a follow-up publication in a scientific journal.

The main target of the Thesis work is a comparative study of three different salt/MOF heat storage materials using the SWTS apparatus.

Possible start of the work: now

If you are interested, please contact: alexandra.lieb@ovgu.de