Production and application of hydrophobin from *Escherichia coli* for aerogel hydrophobization

Master Thesis, 2 parts – IBB (V1) & TVT (V8) (deutsch/english)

Start: ASAP

Aerogels are highly porous solids with large specific surface areas. They can be produced from diverse biopolymers via gelation and supercritical drying with CO\textsubscript{2}. Mostly the surface of aerogels is hydrophilic in nature. For many applications in cosmetic and food industry hydrophobic surfaces and stability against water is required. One of the nature’s way to generate hydrophobic surfaces on biological structures is via integration of so-called hydrophobins. These small proteins from filamentous fungi can be heterogeneously overexpressed in a foreign host (e.g. *E. coli*) and integrated onto a new surface modifying its physical properties. The aim of this thesis is to produce hydrophobin in a fermentative scale, conduct the downstream processing for the required purities, impregnate aerogels with produced hydrophobin and evaluate the changed properties.

First: Institute of Bioprocess and Biosystems Engineering (V1)

**Production of Hydrophobin from *E.coli***

**Tasks:**
- Hydrophobin expression studies in small scale cultivations
- Medium, fermentation parameter optimization
- Production of hydrophobin in a 2 L bioreactor
- Downstream processing incl. cell disruption, pH/solubility-based solid/liquid separation
- Lyophilization of the final product

**Analytical methods:**
- Bradford-Test, SDS-PAGE

Second: Institute of thermal separation Processes (V8),

**Hydrophobization of aerogels with hydrophobin**

**Tasks:**
- Production of biopolymer based aerogels via CO\textsubscript{2} induced gelation and supercritical drying
- Supercritical impregnation of Aerogels with hydrophobin
- Evaluation of the hydrophobin coating: stability test in water and humid air
- Evaluation of the change of the aerogel properties (specific surface area, pore volume)

**Analytical methods:**
- Nitrogen adsorption/desorption to evaluate specific surface area and pore volume (BET/BJH), Scanning electron microscopy, Contact angle measurement, Density measurements

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