Group : Dynamic Polymers
Project : **Metafoam Materials for Low Frequency Sound Absorption**
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Introduction

Noise pollution is an upcoming problem in densely populated areas, especially low frequency noise from industry, traffic, wind turbines and such. Current sound absorption foams work well in high to mid frequency region, however, they are not efficient in the low frequency range. In this project we develop a new type of material, a 'metafoam', combining a polymer foam with heavy weight microparticles to improve the acoustic properties for low frequency sound absorption.

To be able to efficiently absorb noise, an open-cell foam is needed. The vibrating air enters the foam, where it interacts with the polymer matrix and the heavy microparticles, converting it to heat through thermo-viscous dissipation. In this project, open-cell foams will be made via high internal phase emulsions (HIPEs), in which the internal, aqueous phase (>75%) is emulsified by the monomer phase. Upon polymerisation of the monomer phase and evaporation of the aqueous phase, a foam (polyHIPE) is obtained of which the pores are interconnected, Figure 1. Microbeads incorporated in the aqueous phase will remain inside the pores and are able to vibrate upon incoming noise dampening the sound.

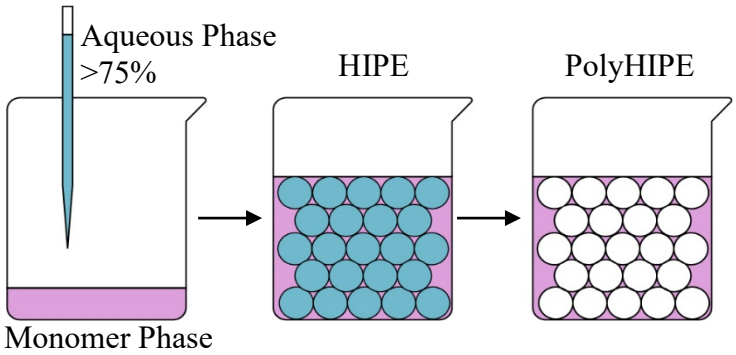

Figure 1. PolyHIPE method to make an open-cell foam.

Project

This project will focus on studying different material compositions and crosslinking conditions in relation to structural and acoustic properties, such as pore size, wall thickness and introduction of microbeads and a secondary fibre/polymer network inside the pores. During this project you will learn how to prepare and manipulate polymer foams via emulsion polymerisation methods and study its structural properties with various analytical methods, including scanning electron microscopy (SEM), Figure 2.

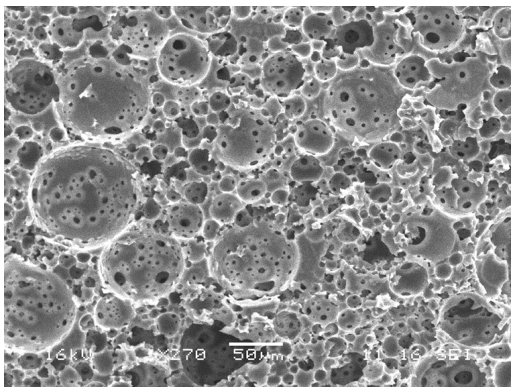

Figure 2. SEM image of a polyHIPE foam

Techniques to be used

- Emulsions, specifically high internal phase emulsions
- Free radical polymerisation
- Scanning electron microscopy

More information

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