# Chitosan-based aerogel beads as reversible $CO_2$ adsorbents

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Polysaccharide aerogels exhibit outstanding properties for many applications including gas filters. Due to high surface area, mesoporosity and the presence of amine groups, chitosan-based aerogels can be used as potential $CO_2$ adsorbents in environmental control systems (ECS). For this application, the chitosan backbone was chemically modified by grafting different molecules onto the amine groups which was carried out either in the gel state or in the gas phase. Within this presentation we will report on chitosan-based gel bead production by the JetCutter, a mechanical cutting machine with high throughput. The sizes of beads were varied between 0.5 and 2 mm in order to produce filter material. Sodium hydroxide solution was used as regeneration bath. After neutralization and solvent exchange to ethanol, supercritical $CO_2$ drying was applied for aerogel production. The $CO_2$ adsorption capacity was characterized at low $CO_2$ partial pressures by dynamic breakthrough measurements using $CO_2/N_2$ mixtures. Desorption of $CO_2$ from chitosan aerogel beads was investigated under nitrogen gas flow at moderate temperatures. The moisture adsorption capacity was measured using humidified nitrogen gas flow. Nitrogen sorption measurements were performed for the evaluation of specific surface area and pore size distribution. Scanning electron microscopy images showed an interconnected nanofibrillar structure of the aerogel beads. FTIR measurements confirmed the successful chemical modification of the chitosan backbone. Chitosan-based aerogel materials can be potential candidates for $CO_2$ filters in ECS as the chemical modification can enhance the $CO_2$ adsorption and the regeneration can be achieved at reasonable temperatures.

Acknowledgements: This project has received funding from the European Union´s Horizon 2020 research and innovation program under grant agreement No 685648