LIGNIN BASED CARBON AEROGELS FOR GAS FILTER APPLICATIONS

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Cellulose and lignin are among the most widespread biopolymers in the world and are found in varying proportions in all plant cells. One resource which is especially interesting is wood which is available in large quantities in Germany and Europe and which is used extensively in our daily lives. Even more, waste wood, which has reached the end of its life cycle and is produced in large quantities every year, is becoming an interesting source of raw materials for the synthesis of new high-quality and sustainable products.

One group of such highly functional materials are aerogels, highly porous solids with up to 99 % pore volume, large inner surfaces of up to 3000 m²/g and small pore sizes. These properties result in low thermal conductivities and high porosities and offer an interesting range of applications such as thermal insulation and filtering applications.

In the presented project lignin-based aerogels are tested for gas filter applications. For this purpose, lignin aerogels are synthesized according to the method described by Aufischer et al. [1]. These aerogels are then carbonised into carbon aerogels and activated with carbon dioxide to form aerogels with an increased inner surface area, a high volume of micropores and the ability to adsorb a wide variety of pollutants.

The synthesis of the aerogels with the reaction of different lignin-formaldehyde ratios as well as the following steps solvent exchange, supercritical drying with CO_2, carbonisation and activation with CO_2 are described. For the different lignin to formaldehyde ratios the inner surface areas, the total pore volume and the micropore volume as well as the pore size distribution will be presented. For selected compositions the microstructure and the characteristic data before and after the carbonisation and activation will be shown.

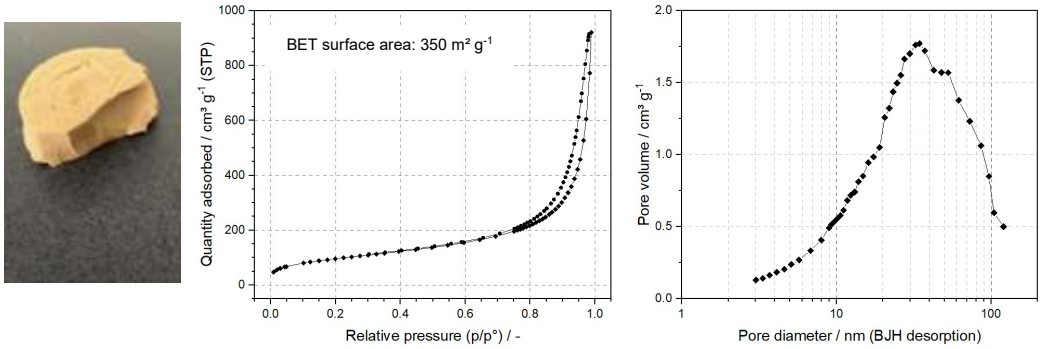

Figure 1. Lignin aerogel with its N_2-isotherm and pore size distribution

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[1] Aufischer, G.; Kamm, B.; Paulik, C., International Journal of Biobased Plastics, **2025**, Vol. 3, 1, 19-28.