NANOPAPERS DERIVED FROM FUNGI IN MEMBRANE AND WATER TREATMENT OPERATIONS

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Chitin is the second most abundant biopolymer after cellulose, occurring in the exoskeletons of crustaceans (e.g. lobsters, crabs and shrimps) or insects and in the cell walls of fungi. The nano-sized chitin-glucan fibrils found in the structure of fungi constitute a nature-made composite. Their excellent film formation properties are beneficial for nanopaper development, to be used as membranes in water treatment applications. Furthermore, adsorption of cationically charged ions (e.g. heavy metal ions) is enabled by N-acetyl groups of chitin-glucan fibrils. Hence, nanopapers from fungi would not only act as size-exclusion filtration membranes but also as adsorption membranes.

In this study, chitin-glucan fibrils were extracted from common mushroom (*Agaricus bisporus*). By vacuum filtration and consolidation at enhanced temperature, chitin-glucan (CG) and hierarchical CG-cellulose sludge composite (SC) papers were prepared. Morphology investigations of CG-papers by SEM showed nanofibrils with an average width of 17 nm. The membrane performance of CG and SC nanopapers was evaluated regarding their permeance and rejection of contaminants. A corresponding pore size of 10 to 12 nm was found through the rejection of macromolecules in aqueous and THF solution. Furthermore, due to interaction of the ions with the N-acetyl group of chitin-glucan fibrils, adsorption of both alkaline earth and heavy metal ions was successfully demonstrated.