

CHITOSAN-DERIVED CARBON AEROGELS: EFFECT OF CROSSLINKING STRATEGY AND PYROLYSIS CONDITIONS ON TEXTURAL AND MATERIAL PROPERTIES

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Carbon aerogels (CAs) show unique properties, which make them promising materials for different applications. In addition to their well-studied application as adsorbents or as supercapacitors, CAs show potential as advanced catalyst carriers, since they exhibit a multiscale porosity, which has the potential to enhance the catalytic efficiency in comparison to commercial solutions (e.g., activated carbons). In particular, they have high microporous specific surface areas (for the anchoring and dispersion of nanoparticles, e.g., metal nanoparticles) and meso/macroporosity for the efficient transport of products and reactants, and they provide electrically conductive materials [1]. The production of CAs involves pyrolysis of organic aerogels, which is performed under an inert atmosphere (e.g., N₂) and at high temperatures. Due to the outstanding textural properties of the products, tailorability and high pyrolysis yield, polycondensated resorcinol-formaldehyde (RF) gels have been the most common starting materials in the polymer-to-carbon aerogel route since the 1990s [1]. A green alternative to RF as starting material is the use of biopolymer aerogels, which can be derived from abundant resources, e.g., from alginate, cellulose or chitosan, the latter showing the advantage of having naturally incorporated nitrogen containing functionalities [2,3]. Due to changes of the pore network during pyrolysis, the challenge to preserve the textural properties arises. In this study, our objective is to elucidate the crucial factors for preserving the pore structure during pyrolysis, examining both the processing parameters and those pertaining to the aerogel-based starting material. Our main findings focus on the role of different crosslinking strategies and chemical stabilization during aerogel synthesis, as well as on the effect of different final temperatures/heating rates during pyrolysis.

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