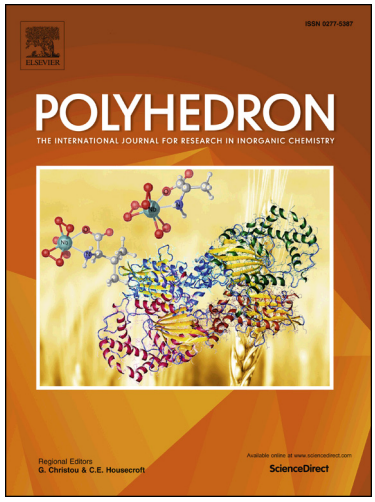

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Strategies Toward Catalytic Biopolymers: Incorporation of Tungsten in Alginate Aerogels

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This paper is dedicated to Professor Spyros Perlepes, a great mentor and scientist, on the occasion of his 65th birthday with our best wishes.

Abstract: We report the synthesis of W-doped biopolymer aerogels with potential applications to catalysis. The biopolymers were based on alginate, a cost-efficient natural material, and were prepared in environmentally friendly water/ethanol solutions. Gelation of alginate was induced by crosslinking with Ca^{2+}. The resulting wet-gels were impregnated with an ethanolic solution of the ditungsten complex $[W_2(\mu\text{-}OEt)_2(OEt)_2(EtOH)_2Cl_4]$ ($\{W{\equiv}W\}^{8+}$) and were dried with supercritical fluid (SCF) CO_2 to yield W-doped alginate aerogels containing 10% w/w tungsten. Dry materials were characterized with FTIR, SEM/EDS, TGA, N_2 porosimetry and He pycnometry. The bulk densities were low (<0.1 g cm^{-3}), porosities were high (96% v/v), as well as the BET surface areas (380 m^2/g). Pyrolysis of those aerogels at 800 ^oC under Ar yielded carbon along with a mixture of calcium tungstates, i.e., $CaWO_4$ and Ca_3WO_6 (weight ratio: 70:30), while pyrolysis under O_2 yielded the same tungstates, but with a different weight ratio (10:90). This can be a new process for Ca_3WO_6, which, due to its ordered double perovskite structure, is ideal for doping with metal ions, at relatively low temperature (800 ^oC *vs.* >1000 ^oC in the literature).