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Self-Supporting Films of Ordered Mesoporous Carbon based on Tailored Polyether Templates for Application in Electrocatalysis under Confinement

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"Reverse *Pluronic*" block copolyethers ($PPO_{n/2}$-PEO_m-$PPO_{n/2}$) with tailored PPO block lengths (*m* = 90-450, *n/2* = 20-200) were prepared using advanced, borane-based polymerization catalysis [1-4]. The thus obtained amphiphilic block copolyethers were then employed as nanostructure-directing agents in a soft-templating approach. The mesoporous structure is generated by organizing the block copolyethers in EtOH together with oligomerized phenolic resins (= carbon precursors) in an evaporation-induced self-assembly (EISA) process [5-6]. Subsequent crosslinking (80-100 ºC) and carbonization (600-700 ºC) yields a series of mesoporous carbon materials (OMCs) with identical pore arrangement (hexagonal) and comparable surface properties – meaning the OMC samples differ only in their respective mesopore diameters (6-18 nm, depending on *m* and *n/2*) and are thus suitable for the identification of confinement effects [7]. In current work, these achievements are transferred to the preparation of self-supporting OMC films (100 µm thickness, 1-10 cm^2). Essential parameters are pore arrangement (preferred: 3D-connected pore systems for better diffusion properties of the film), pore size, mechanical stability of the film and the presence of surface functionalities for subsequent catalyst immobilization.
OMC films carrying covalently bound Fe- and Co-porphyrin catalysts are used as thin film electrodes or gas diffusion electrodes for the electrocatalytic reduction of CO_2, with the aim of producing C_{2+} products.

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