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3D tuned porous carbon monoliths as catalysts in wet peroxide oxidation of paracetamol

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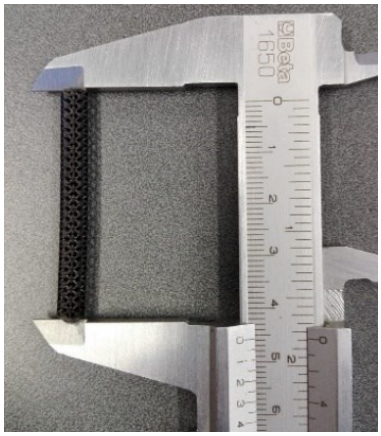
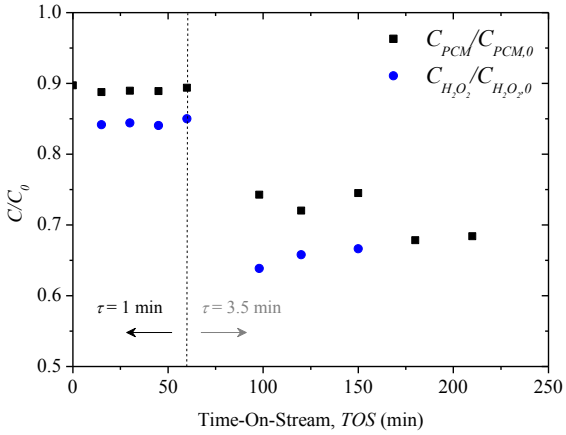
In recent years, many pharmaceuticals have been identified at trace levels worldwide in the aquatic environment [1]. Municipal wastewater treatment plants (WWTPs) are considered the main sources of these pollutants as they are not generally prepared to deal with such complex substances and thus, they are usually ineffective in their removal [1]. Despite the low concentration of drugs contained in those effluents, the presence of pharmaceuticals, even in trace concentrations, affects the quality of water and constitutes a risk of toxicity for the ecosystems and living organisms [1-2]. Consequently, new regulation for micropollutants discharge and monitoring has been issued in Europe (Directive 2013/39/EU). Paracetamol (PCM) deserves particular attention, since it has recently been discovered as a potential pollutant of waters, largely accumulated in the aquatic environment [3]. This work deals with the treatment of PCM, used as a model pharmaceutical contaminant of emerging concern, by catalytic wet peroxide oxidation using carbon-based monoliths (Fig. 1a) as catalysts. Monoliths were prepared by stereolithographic 3D printing of a photoresin, which was later converted into porous carbon by oxidation in air (300 °C, 6 h) and subsequent pyrolysis in N_2 (900 °C, 15 min) as described elsewhere [4]. The materials revealed catalytic activity in the CWPO of PCM allowing to reach PCM conversions up to 30% with a residence time of 3.5 min (Fig. 1b).



(a)



(b)

Fig.1. (a) Photograph of a monolith and (b) relative concentration of PCM and H_2O_2 upon *TOS*.

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