Boke, N. et al. (2013). Synthesis of an ordered mesoporous carbon with graphitic characteristics and its application for dye adsorption.
Journal of Porous Materials, 20: 1153 – 1161.
http://dx.doi.org/10.1007/s10934-013-9698-y



# Synthesis of an ordered mesoporous carbon with graphitic characteristics and its application for dye adsorption

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## Abstract
An ordered mesoporous carbon (OMC) was prepared by a chemical vapor deposition technique using liquid petroleum gas (LPG) as the carbon source. During synthesis, LPG was effectively adsorbed in the ordered mesopores of SBA-15 silica and converted to a graphitic carbon at 800 °C. X-ray diffraction and nitrogen adsorption/desorption data and high-resolution transmission electron microscopy (HRTEM) of the OMC confirmed its ordered mesoporous structure. The OMC was utilized as an adsorbent in the removal of dyes from aqueous solution. A commercial powder activated carbon (AC) was also investigated to obtain comparative data. The efficiency of the OMC for dye adsorption was tested using acidic dye acid orange 8 (AO8) and basic dyes methylene blue (MB) and rhodamine B (RB). The results show that adsorption was affected by the molecular size of the dye, the textural properties of carbon adsorbent and surface-dye interactions. The adsorption capacities of the OMC for acid orange 8 (AO8), methylene blue (MB) and rhodamine B (RB) were determined to be 222, 833, and 233 mg/g, respectively. The adsorption capacities of the AC for AO8, MB, and RB were determined to be 141, 313, and 185 mg/ g, respectively. The OMC demonstrated to be an excellent adsorbent for the removal of MB from wastewater.

## 1 Introduction
Large volumes of colored wastewater are generated by both dye manufacturing processes and dye consuming industries such as the textile, leather and paper and plastics industries [1–3]. Two percent of dyes that are produced are directly released into aqueous effluent, and in textile industry, 10 % of the dyes are lost during coloration process [2]. Untreated wastewater can reach and mix with water bodies and have harmful impacts on the environment [4]. Dye concentrations as low as 1 mg/L imparts color to drinking water [5]. Many dyes may be toxic and even carcinogenic [1]. For the protection of public health and environmental quality, wastewater must be treated before it is returned to the environment for further use.

Several treatment methods have been applied for the removal of dyes from wastewaters, such as sedimentation, filtration, chemical treatment, oxidation, electrochemical methods, advanced oxidation processes, biological treatment, adsorption and ion exchange [6]. Among these methods, adsorption is considered to be an effective and economic method for the elimination of dyes from waste-water [7]. Activated carbon has been widely investigated as an adsorbent in the removal of color originating from different types of dyes such as acid, basic (cationic), disperse, direct, reactive and solvent dyes [6, 8]. Activated carbons usually contain micropores (0–2 nm), which prohibit the entrance of large molecules, and consequently exhibit low adsorption capacities for large dye molecules [9–

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