Atti del XXIX Congresso della Divisione di Chimica Analitica della Società Chimica Italiana

Milazzo (Messina)

11-15 Settembre 2022

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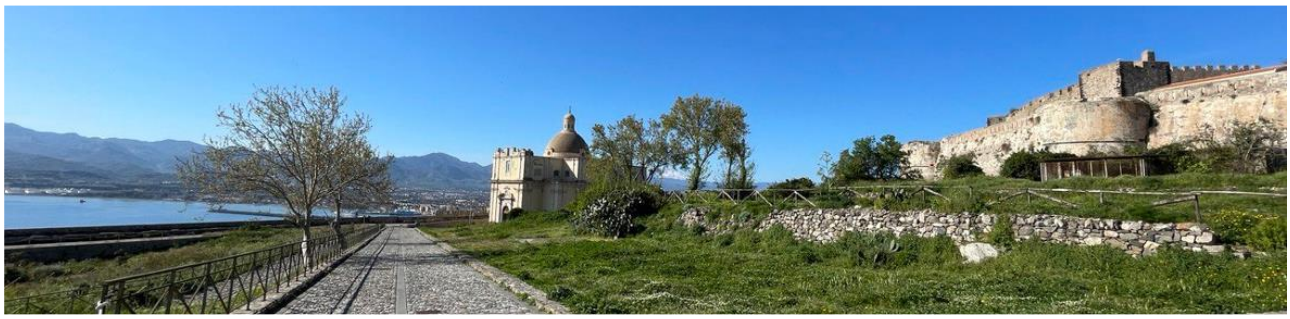

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NANOSTRUCTURATED CARBON MATERIALS FOR THE REMOVAL OF PFAS FROM WATER MATRICES FOR ENVIRONMENTAL APPLICATIONS

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Per- and polyfluoroalkyl substances (PFAS) are a class of anthropogenic organo-fluorine compounds with hydrogen atoms on the alkyl chain replaced by fluorine atoms. Due to their unique chemical and physical properties PFAS have been widely used as surfactants, fire retardants, lubricants [1]. The widespread industrial applications have released large amounts of PFAS into the aquatic systems. It is therefore very important to study new methods for the removal of pollutants from water environment, and membrane-based technology is becoming a competitive alternative with respect to traditional methods. Particularly, mixed matrix membranes (MMMs), that are composed by a dispersed inorganic filler and a continuous polymer phase have gained importance due to their fouling, permeate quality and longevity characteristics. This work focuses on the removal of perfluorooctanoic acid, one of the most widely detected PFAS in groundwater and surface, using MMMs with different physical and chemical characteristics. To obtain the MMMs, nanostructured carbon material has been included in several formulations of hydrogels, and the adsorption efficiency of all the formulations had been determined and compared to the adsorption of powder nanostructured carbon. For all MMMs, adsorption kinetic and isotherm studies were carried out. Kinetic studies showed that within 4.5 hours the kinetic equilibrium is reached for all the MMMs considered, while using powder of carbon material it is reached in few minutes The results obtained showed that the MMMs have a higher adsorption efficiency than the powdered nanostructured carbon material. Furthermore, the different hydrophilicity, swelling and cross-linking characteristics play a fundamental role in the saturation capacity (q_s) of different MMMs. A comparison between powder and MMMs showed that q_s was improved when the nanostructured material was embedded into a hydrogel formulation.

[1] B. Abada, T.E.G. Alivio, Y. Shao, T.E. O'Loughlin, C. Klemashevich, S. Banerjee, A. Jayaraman, K.H. Chu, Environ. Pollut. 243 (2018) 637–644

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