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Synthesis of bio-derived carbon/silica composites for the removal of gold from aqueous solutions

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The presence of precious metals, such as gold, in secondary wastewater streams generates concerns over the future availability and easy of accessibility of the metal and as a result its recovery is vital to achieve a circular economy. Recent literature has provided substantial evidence that the use of bio-derived porous carbonaceous silica materials as adsorbents is a green route to treat and purify contaminated water streams. Many materials have been produced to recover a combination of metals; however the need for development of materials with specific metal selectivity remains a key goal. Previous work has exhibited the viable production of mesoporous Carbon-Silica Composites (CSCs) from renewable waste biomass feedstock to use in separation techniques, electronics, energy storage, catalysis, water treatment and more. Herein, a series of novel bio-derived CSCs have been synthesized which exhibit great selectivity towards the removal of gold from dilute solutions. The materials are made via the wet impregnation of silica into bio-oil from the pyrolysis of waste office paper, followed by carbonization at different temperatures (300-800 °C). Materials are temperature-dependent, ranging from polymerized bio-oil composites at 300 °C to graphitic-like composites at 800 °C varying the carbonization temperature during synthesis has a great influence on the textural properties, surface functionalities and maximum loading capacities, leading to materials with high adsorption capacities for gold up to 320 mg g^{-1} and up to 100% gold recovery.

Biography

Konstantina Sotiriou is currently pursuing her PhD from The Green Chemistry Centre of Excellence, University of York, UK. She had obtained her undergraduate degree in Chemistry from The University of Reading and her MSc from Green Chemistry and Sustainable Industrial Technology at the Green Chemistry Centre of Excellence, University of York, UK. She was part of the PHYTOCAT team and is co-author on review paper on phyto-extraction as tool for green chemistry. She is currently synthesizing bio-based materials for the recovery of metals from aqueous media.

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