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Removal of Cu(II) from aqueous phase using tailor made sulfur-impregnated activated carbon inspired by Claus process

Krishnan Anoop Krishnan[a,*], Kumaran Girija Sreejalekshmi[b], Vinu V. Dev[a], Sibin Antony[a], Harsha Mahadevan[a]

[a]*NREM, National Centre for Earth Science Studies (NCESS), Ministry of Earth Sciences (MoES), Akkulam, Trivandrum 695011, India, Tel. +91 9447402468; emails: sreeanoop@rediffmail.com (K. Anoop Krishnan), vinuvdev.dev@gmail.com (V.V. Dev), santony41@gmail.com (S. Antony), harshmahadevan@gmail.com (H. Mahadevan)*
[b]*Department of Chemistry, Indian Institute of Space Science and Technology (IIST), Department of Space, Near LPSC, Valiamala Post, Trivandrum 695547, India, sreejalekshmi@gmail.com (K.G. Sreejalekshmi)*

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ABSTRACT

The study assesses the effectiveness of sugarcane biomass based sulfur-impregnated activated carbon (SIAC) in removing Cu(II) from aqueous phase in conditions. The sulfurization of activated carbon was effected by an adapted Claus process to leverage on the affinity of Cu(II) for sulfur. The optimum pH for the adsorption of Cu(II) onto SIAC was found to be at 6.0. It was observed that an amount of 11.84 mg/g (94.7%) and 22.83 mg/g (91.3%) of Cu(II) was removed from an initial Cu(II) concentration of 25 and 50 mg/L, respectively. The adsorption kinetic data were modeled using pseudo-second-order kinetics. The equilibrium data exhibit a Langmuir type isotherm and a quite higher adsorption capacity value of 73.53 mg/g was obtained. The reusability of the spent adsorbent was determined and found that about 77.4% of the initial desorption capacity was retained after the fourth cycle. This establishes the technical feasibility of the adsorption process. Moreover, the adsorption studies were conducted for a series of simulated and wastewaters containing Cu(II) and the results obtained were of promising ones for water treatment strategies.

Keywords: Adsorption; Claus process; Cu(II); Removal; Sulfur impregnation

* Corresponding author.