AB238

Comparative study on the adsorptive behavior of As(III) and Cr (III) ions from aqueous solution on to sawdust and rice husk biochar

S.K.Gunatilake[1]

Sorption capacity of two different biochar (saw dust and rice straw) was evaluated in the recovery of arsenic and chromium from aqueous solutions. Biochar from rice straw and saw dust were obtained from pyrolysis of biomass at 400°C. The optimum sorption conditions were studied for different concentrated monometallic system. Sorption studies were performed at different pH, contracting time and different initial metal ion concentration in the batch mode. The optimum pH was 3 for recovery of As(III) and 5-7 for Cr(III). Kinetic studies yielded an optimum equilibrium time of 50 minutes with an adsorbent dose of 1 g/L and initial concentration ~20 mg/L for both ions. Metal ions in aqueous solution were transported to biochar surface through adsorption and intra-particle diffusion process. Experimental data for both metal ions were fitted a Langmuir model with R^2 value for As(III) 0.969, 0.879 for saw dust and rice straw respectively while 0.971, 0.99 for Cr(III) ions. The Freundlich constant, K_F values for removal of As(III) and Cr(III) ions by saw dust and rice straw were 0.9127, 0.8951 and 0.944, 0.844 respectively. The 1/n value for arsenic and chromium ions obtained from saw dust and rice straw were 0.209, 028 and 0.862, 0.84 respectively and indicate the normal sorption of As(III) and Cr(III). The values indicated the affinity of the sorbent towards the uptake of both ions and adsorptions of the metal ions were favorable. According to FTIR analysis As(III) as well as Cr(III) metal ions bound to active sites of the biosorbents in different biochars through either electrostatic attraction or complexation mechanism. The electrostatic attraction between metal ion and carbonate group and complexation mechanism between electron donor atoms (O and N) are occurred. These results indicated that carbonyl, hydroxyl, amine and halides are the main adsorption sites in saw dust and rice straw biochar and these functional groups complexes with As(III) and Cr(III) ions in the aqueous solution and changed the chemical environment of the functional groups in the biochar. The results showed that rice straw and saw dust biomass can be used to remove Arsenic and Chromium ions from aqueous phase.

Key words: *Heavy metals, biochar, sorption capacity, adsorption isotherms*

[1] Department of Natural Resources, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka