Impact of the use of co-adjuvants agents during chemical activation on the performance of activated carbons in the removal of 4-chloro-2-methyl-phenoxyacetic acid

The present work discusses the influence of additives, designated as co-adjuvants agents of the chemical activation, containing nitrogen on their structure, on the activated carbons (ACs) produced from waste of polyethylene terephthalate (PET) and cork by chemical activation, with KOH, at 973 K. The co-adjuvants agents used were urea, 2-chloro-4,6-diamino-1,3,5-triazine, (2-hydroxyethyl) urea and polyethylenimine. The ACs, produced from PET, only activated with KOH presented a porous volume of 0.53 $cm^3\ g^{-1}$. The chemical activation of PET with KOH and urea, or 2-chloro-4,6-diamino-1,3,5-triazine or (2-hydroxyethyl) urea allows obtaining ACs with a porous volume upper than 0.91 cm^3g^{-1}. The same improvement (porous volume higher than 0.93 cm^3g^{-1}) was achieved with cork, with urea or polyethylenimine. On all ACs produced with the four co-adjuvants agents, an increment in the nitrogen content was very noticeable. The high thermal stability of these ACs allows inferring, that the nitrogen was directly connected to the ACs array, and not only retained on the surface. These ACs were successfully tested on 4-chloro-2-methyl-phenoxyacetic acid (MCPA) removals from the aqueous medium, with removal percentages ranging from 65% in solutions containing 2.50 mmol L^{-1} to 100% in solutions with concentrations lower than 0.25 mmol L^{-1}. Five ACs had an MCPA adsorption capacity greater than 3.7 mmol g^{-1}, meanwhile, the highest value found in the literature was 2.99 mmol g^{-1} on the commercial AC-GAB (Spaltro et al., 2018).