

## Abstract

The continuous monitoring and protection of the quality of water resources plays an important role in public health and also in the environment. Given this major importance, this study was conducted in order to determine the level of contamination of groundwater in the wilaya of Constantine. On the other hand, the protection of these water resources against pollution. Water samples were collected in two regions: Ain Smara and Ibn Badis. Physicochemical and microbiological analyses were carried out, and it was found that the groundwater selected was chemically and bacteriologically unsuitable for human consumption. Human activities have a significant influence on the quality of water resources in Constantine. For this purpose, we tried to develop an original adsorbent to treat the influence of these activities. The coating of the fibrous skeleton of *luffa cylindrica* (LC) with polyaniline (PANI) was carried out by in-situ polymerization of aniline. A thin PANI layer in its emeraldine-salt form got bound on to the LC surface, as revealed by the green color the latter developed, procuring more roughness to the luffa fibers. The surfaces of both materials, i.e., the purified original luffa (LC) and the PANI-coated luffa (PANI/LC) were characterized by FTIR, completed by the Raman, SEM/EDX and XRD. After characterization, PANI/LC was tested for its capacity to adsorb hexavalent chromium anionic species. First, the emergence of the chromium characteristic peak in the EDX spectrum brought experimental evidence for the effective sorption of chromium onto the PANI/LC surface. Then, the novel material displayed a high efficiency to retain the metallic pollutant, going up to  $\sim 300$  mg/g. Thus, after the PANI-grafting, this light and cheap agricultural by-product should compete advantageously with commercial anionic exchangers, at least in terms of efficiency and economically. Besides, adsorption parameters were examined. The Cr (VI) uptake process was found to follow second order kinetics. The computed thermodynamic parameters (namely  $\Delta H^\circ$ ,  $\Delta S^\circ$  and  $\Delta G^\circ$ ) indicate that adsorption is exothermic and spontaneous. None of some classical models fitted the equilibrium sorption data, a result that expresses the sorption mechanism complexity.

**Keywords:** Groundwater, Physicochemical and microbiological analysis, Water treatment, Polyaniline, *Luffa cylindrica*, Chromium adsorption