Abstract

Water contamination by arsenic (As) takes place over extended geographic areas and it represents an environmental issue of global concern due to the severe threats to human health. One main limitation in applying As treatment systems is the high cost of conventional adsorbents (5-10 € kg-1, granular ferric oxides, GFO). In recent studies, hydrothermal carbonization (HTC) was proved to be a promising process to convert olive pomace (an agro-industrial by-product) to an innovative adsorbent for As removal by combining HTC with iron oxide doping (by precipitation). However, to date, a major gap in this scientific field is the needing for scalable granulation and activation systems to convert the hydrochar powder to particles with higher size, surface area and water stability (namely reduced release of organics), suitable for their use in fixed bed-columns. The aim of this work was to contribute on filling this gap, by studying a process to transform the bio-adsorbent powder (iron doped hydrochar, IH) to granules usable in fixed bed columns. Different common binders were compared; among these, sodium silicate showed better results, at content between 36-53 %, allowing to produce an adsorbent able to remove up to 12.2 mg g-1 As. However, the increase in activation temperature and silicate % increased the alkaline property of the adsorbent, which required up to 9.4 mol H+ g-1 for neutralization, indicating a preliminary washing required before its application for water treatment. Preliminary cost analysis indicated that the cost to be sustained for silicate binder addition could be compatible with the production of a cheaper adsorbent; however, a more comprehensive analysis of the whole process is required.