Synthesis and functionalization of polymeric fibers for the removal of arsenic and vanadium contaminants from polluted waters

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SUMMARY

The water contamination with arsenic is a world-wide environmental concern. Since arsenic is carcinogen even at low concentrations and not biodegrabable, it must be removed from polluted waters in response to growing environmental legislation and enforcement. Other metal of environmental concern is vanadium. It appears in the most recent EPA contaminant candidate list. Because of the significance of these two metals, robust methods are needed for their removal from polluted waters.

The present proposal seeks the development of novel bio-functionalized fibrous sorbents to remove current (As) and emerging (V) pollutants from water. The proposed system takes advantage of the extremely high chemical affinity of arsenic and vanadium to the sulhydryl group, to be provided by peptides, and the expected functionalization of reusable, large-surface area and mechanically robust polymeric fibers produced by electrospinning process. Based on structural and surface chemistry affinity with peptides species, polyacrylonitrile (PAN) and chitin will be evaluated to produce the polymer fibers.

The Bioprocess Development and Training Complex (BDTC) will play an essential role in this project, since the peptide synthesis and the functionalization will take place in their facilities. Furthermore, our team will offer a training course entitled: ‘Theory and practice of pollutants detection in water and gaseous matrixes’. Collaboration with industries to develop polymeric materials will also be established through the BDTC.

Undergraduate and graduate students will be impacted through this project. They will be exposed to a multidisciplinary project, which involve chemistry, materials engineering and mechanical engineering.