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Arsenic adsorption into thermally treated dolomite

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In this work, the removal of arsenic (As(III) and As(V)) from aqueous solutions onto thermally processed dolomite is investigated. The dolomite was thermally processed (charred) at the following temperatures: 600 oC, 700 oC and 800 oC; for 1, 2, 4 and 8 hours. Isotherm experiments were carried out on these samples over a wide pH range. The maximum removal was found with the materials which were charred at 800 oC, but thermal degradation of the dolomite at this temperature weakens its structure due to the decomposition of the magnesium carbonate, which leads to the partial dissolution of this charred dolomite when in contact with water. The optimum dolomitic sorbent chosen for further investigations was the one that was charred for 8 hours at 700 oC material. Equilibrium investigations on this charred dolomite have been undertaken to determine its potential as an adsorbent. The maximum arsenic uptake capacity was found to be 2 mg/g for arsenate and arsenite. Isotherm studies indicated that the Langmuir model was successful in describing the process to a better extent than Freundlich model for the As(V) adsorption on the selected charred dolomite. However, for the As(III) adsorption, the Freundlich model was more successful in describing the process. SEM images show the formation of new crystals on the surface of the charred dolomite after As(V) adsorption which implies the adsorption of As(V) on the monolayer of the sample as Langmuir model states, while it shows the formation of new voids alongside the new crystals on the surface after the adsorption of As(III). This confirms that the adsorption of As(III) did not only take place on the monolayer of the sample, but also in the inner layers which explains the successful representation of this process by Freundlich model. The data suggests that the charring process allows dissociation of the dolomite with calcium carbonate and magnesium oxide, which accelerates the process of arsenic oxide and arsenic carbonate precipitation.

Biography

Yousef Salameh is an Assistant Professor in the chemical engineering department, American University of Beirut. He holds a PhD degree in chemical engineering from the Queen's University of Belfast, UK, with specialization in drinking water treatment systems. He also has a BSc in chemical engineering from the University of Jordan. He is a Member of the QUESTOR center, a global environmental research network. He has published papers and given presentations both at the local and international levels in the area of his expertise and has served as an Editorial Board Member of the World Academy Of Science, Engineering and Technology.

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