Review

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Evaluation of adsorption processes of metal ions in multi-element aqueous systems by lignocellulosic adsorbents applying different isotherms: A critical review

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Abstract:

In recent years studies demonstrated good efficiency of lignocellulosic materials for adsorption and removal of toxic ions from water, however many of them are related to mono-element adsorption processes, which does not adequately describe a real aqueous system. This critical review article provides recent studies on adsorption processes in multi-element aqueous systems using natural or modified lignocellulosic adsorbents, characteristics of lignocellulosic materials, competition between metal ions in multi-element solutions, main adsorption isotherms for bi-element and multi-element systems and their applications. Trend, evolution and application of lignocellulosic materials in multi-element systems and main factors responsible for adsorption process of metal ions in lignocellulosic materials are also discussed and evaluated. It is evident, from the bibliographical research, that works on mono-element adsorption are abundant, whereas in multi-element systems are scarce. Several studies describing mechanisms of adsorption of toxic ions in lignocellulosic materials have been found, but they have reported several contradictory or non-complementary results, which makes necessary to study in depth how these mechanisms occur. In addition, many studies demonstrated good fits of multi-element isotherms to the experimental data, although some limitations of these models were found in specified cases.

Keywords: multi-element adsorption isotherm, lignocellulosic adsorbent, sorption of metal, competitive adsorption, natural adsorbents.

Summary: