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POWDERED MARBLE WASTES REUSE FOR CADMIUM REMOVAL FROM AQUEOUS SOLUTIONS UNDER DYNAMIC CONDITIONS

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Abstract

A factorial design analysis was performed in order to determine the significant factors influencing cadmium removal from aqueous solutions by powdered marble wastes (PMW), using a continuous stirring tank reactor (CSTR) system. Investigated factors were initial cadmium aqueous concentration (5-30 mg L^{-1}), PMW dosage (5-15 g L^{-1}) and flow rate (20-40 mL min^{-1}). Results showed that the cadmium aqueous concentration and PMW dosage were the most influencing factors on metal removal from synthetic aqueous solutions. Furthermore, interactions between cadmium concentration-PMW dosage and cadmium concentration-flow rate have also significant effects. The optimal conditions for highest cadmium removal rate by PMW (96.04%) were established at initial cadmium concentration of 5 mg L^{-1}, adsorbent dosage of 15 g L^{-1} and flow rate of 20 mL min^{-1}. According to SEM, EDS and especially XRD analyses, cadmium removal is likely to be controlled by adsorption onto particle surface through cation exchange and complexation. On the other hand, the competition between four metals showed that the selectivity sequence of the metals was: Pb > Cu > Zn > Cd. The proposed low cost material efficiently removes metals present in synthetic solutions and can be applied for industrial effluents treatment.

Key words: cadmium, CSTR, factorial design, marble wastes, removal

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