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Study of the performances of low-cost adsorbents extracted from *Rosa damascena* in aqueous solutions decolorization

Majid Kermani[a,b], Hassan Izanloo[c], Roshanak Rezaei Kalantary[a,b], Hossein Salehi Barzaki[d], Babak Kakavandi[e,f,*]

[a]*Research Center for Environmental Health Technology, Iran University of Medical Sciences, Tehran, Iran*
[b]*Department of Environmental Health Engineering, School of Public Health, Iran University of Medical Sciences, Tehran, Iran, Tel. +98 21 86704627; emails: majidkermani@yahoo.com (M. Kermani), rezaei.r@iums.ac.ir (R.R. Kalantary)*
[c]*Research Center for Environmental Pollutants, Qom University of Medical Sciences, Qom, Iran Tel. +98 25 37842227; email: h-izanloo@muq.ac.ir*
[d]*Department of Environmental Engineering, Islamic Azad University, West Tehran Branch, Tehran, Iran, Tel. +98 21 3458854; email: salehi.h@yahoo.com*
[e]*Research Center for Health, Safety and Environment, Alborz University of Medical Sciences, Karaj, Iran*
[f]*Department of Environmental Health Engineering, Alborz University of Medical Sciences, Karaj, Iran, Tel. +98 26 34643398; email: kakavandibvch@gmail.com*

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ABSTRACT

Till date, few studies have been conducted in order to evaluate the efficiency of *Rosa Damascena* waste (RDW) for dyes removal from aqueous solution. In the present study, the powder and ash were prepared from RDW as inexpensive and locally-available materials for the preparation of the adsorbents to remove Reactive Red 198 (RR198) and Reactive Blue 29 (RB29) dyes from aqueous solution through batch experiments under operational factors namely, pH of solution, contact time, adsorbent dosage, initial dyes concentration and temperature. Physicochemical, morphological and structural properties of the adsorbents were also characterized using SEM and XRD instruments. Adsorption percentage of both dyes on the ash surfaces were significantly higher than that of powder. Results revealed that the adsorption efficiency increased with an enhancement in the adsorbent dosage and contact time. While, a decreasing trend was observed in dye adsorption with increasing the initial concentration of dyes. The equilibrium contact time was found to be 60 min for both the adsorbents. The experimental data were also best fitted with Langmuir isotherm and pseudo-second-order kinetic models. It was found that intraparticle diffusion was not the only rate-determining step of adsorption processes. The calculated values of the thermodynamic parameters such as $\Delta G°$, $\Delta H°$ and $\Delta S°$ demonstrated that the adsorption of RR198 and RB29 onto both the adsorbents were endothermic and spontaneous in nature. The adsorption percentage of RR198 and RB29 dyes on ash *Rosa Damascena* waste slightly declined from 88.8% to 61.0% and 91.3% to 66.1%, respectively, after five consecutive cycles. In conclusion, powder and ash derived from RDW are very effective and suitable adsorbents for reactive dyes removal from aquatic environment, due to their simple and cheap preparation, easy availability and good adsorption capacity.

Keywords: Low-cost adsorbent; *Rosa damascena*; Adsorption; Reactive dye; Modeling adsorption

* Corresponding author.