



## Adsorption of Congo red from aqueous solution onto pyrolusite reductive leaching residue

Wu Shen, Bing Liao, Weiyi Sun, Shijun Su, Sanglan Ding\*

*Department of Environmental Science and Engineering, Sichuan University, Chengdu 610065, China*  
Tel. +86-28-8546 0916; email: [dslscu@163.com](mailto:dslscu@163.com)

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### ABSTRACT

This study investigated the potential use of pyrolusite reductive leaching residue (PLR), a low-cost residual solid by-product in manganese hydrometallurgy, as alternative adsorbent for removal of Congo red (CR) from aqueous solution. The surface characteristics of the PLR were measured. The effect of contact time was experimentally studied to evaluate the adsorption capacity, kinetics, and equilibrium. Experimental results revealed that the adsorption process almost finished within 300 min; adsorption capacity of the PLR increased with increasing initial CR concentrations and temperature. CR uptake process obeyed the pseudo-second-order kinetics. The CR uptake process was best described by the Langmuir isotherm with maximum monolayer adsorption capacity of 45.66 mg/g at 25 °C. Thermodynamic studies showed CR adsorption onto the PLR was endothermic and spontaneous in nature. The regeneration studies showed that the PLR has good reuse performance. The results indicated that PLR could be employed as low-cost alternatives for removal of CR from industrial wastewater.

*Keywords:* Congo red; Pyrolusite reductive leaching residue; Adsorption; Desorption; Reuse

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\*Corresponding author.