Performance and adsorption mechanism of textile dyes with a modified material

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Abstract: This study utilizes a carbonated material (CM) to remove two different azo textile dyes, namely Remozol Black 5 (RB5) and Acid Orange 1 (AO1), from synthetic solutions. This material was calcined at 900 °C to decompose into CaO-MgO mixture. The latter was characterized by laser granulometry, SEM and FTIR. The effects of initial concentration, contact time, equilibrium data and temperature were examined. AO1 at equilibrium increases strongly with increasing adsorption temperature. RB5 was more strongly adsorbed than AO1, viz. 125.9 against 36.8 mg g^{-1} at 55 °C, respectively. The process reflects a weak chemical interaction between the amine function of RB5 and the carbonate materials surface. an electrostatic attraction and hydrogen bonding phenomenas between the negative charge of acid Orange I of the sulfonate group and the positive charge of carbonate materials represented by $MgOH^+$, and hydrogen bonding between $Ca(OH)_2$ and $Mg(OH)_2$, and the hydroxyl group of the azo-molecule. The understanding of the RB5– CM900/acid OA1– CM900 mechanism constitutes a fundamental approach to develop the application of these materials in the wastewater treatment.

Keywords: carbonate material; adsorption; azo dyes; calcined; mechanism.

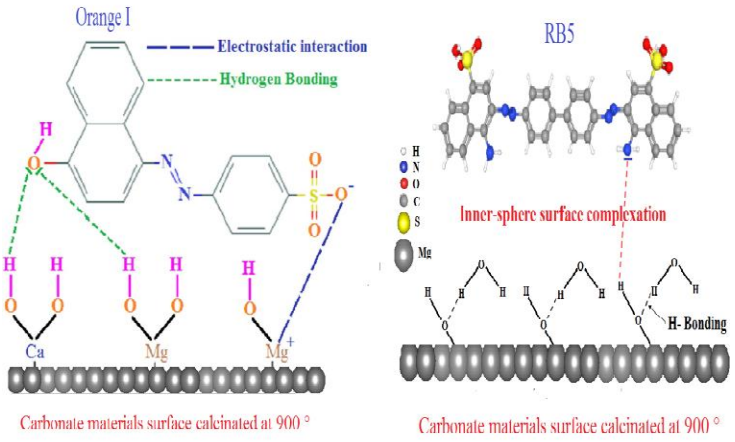

Fig.1. Adsorption mechanism of Orang I and RB5 by CM 900