

## **Sorption mechanisms of chromate with ferrihydrite through coprecipitation in aqueous solution**

ABDULLAH AL MAMUN\*<sup>1</sup>, CHIHARU TOKORO<sup>2</sup>,  
MASAO MORITA<sup>1</sup>

<sup>1</sup> Graduate School of Creative Science and Engineering, Waseda University, 3-4-1 Okubo, Shinjuku-ku, Tokyo 169-8555, Japan  
(\*Correspondence: mamun@toki.waseda.jp), (masao.swimer@akane.waseda.jp)

<sup>2</sup> Faculty of Creative Science and Engineering, Waseda University, 3-4-1 Okubo, Shinjuku-ku, Tokyo 169-8555, Japan (tokoro@waseda.jp)

Hexavalent Chromium attracted researcher interest as for its availability in the natural water from tanneries, metallurgy and electroplating industries. Due to its long lasting adverse impact on the environment and human health, World Health Organization (WHO) restrained the effluent discharge limit to 0.5 mg/dm<sup>3</sup>.

Coprecipitation with minerals is one of the favourable tools to immobilize the waste water anions. Since ferrihydrite contains good absorbent quality, thus getting more attention worldwide especially removing low concentrated anions like arsenate, chromate, selenium etc[1]. Few researchers have tried to remove chromate by ferrihydrite with some value addition but not clearly understood and demanded more in-depth study with pure ferrihydrite. Therefore, the objective of this study was to identify the sorption mechanism of the chromates with ferrihydrite through quantitative evaluation.

Adsorption and coprecipitation experiment was done with pH 5 and pH 7 to understand the removal rates and drawing sorption isotherm. Though all the cases showed BET type isotherm but coprecipitation at pH 5 showed more chromium removal efficiency, that was almost twice sorption density than that of pH 5 adsorption. Like sorption density, X-ray diffraction showed identical mineralogical differences along with changing initial Cr/Fe molar ratio, that is, peak shift was confirmed at lower Cr/Fe molar ratio in coprecipitation whereas adsorption process showed that at higher Cr/Fe molar ratio. In addition,  $\zeta$  potential of pH 5 Coprecipitation suggested that different mechanism starts from Cr/Fe molar ratio around 0.5. ESR was done to confirm the oxidation states of chromium in supernatant and precipitates. Fourier transformed spectra of Cr-K edge showed the changing sorption mechanism in higher Cr/Fe molar ratio in coprecipitation.

[1] Chiharu Tokoro, Yohei Yatsugi, Hiroshi Sasaki and Shuji Owada (2008), *Resources Processing* 55, 3-8