Treatment mechanism of chromium-containing wastewater with carbonate minerals

Chao Ma\textsuperscript{a}, Haixia Liu\textsuperscript{b}, Hui Wang\textsuperscript{b,*}, Guohua Gu\textsuperscript{a}

\textsuperscript{a}Department of Mineral Engineering, School of Resources Processing and Bioengineering, Central South University, Hunan Research Academy of Environmental Sciences, Changsha, Hunan 410083, China

\textsuperscript{b}Key Laboratory of Resource Chemistry of Nonferrous Metals, Ministry of Education, School of Chemistry and Chemical Engineering, Central South University, Changsha, Hunan 410083, China

Tel. +86 731 88879616; email: huiwang1968@163.com

Received 18 September 2012; Accepted 3 December 2012

\textbf{ABSTRACT}

The pH scope for neutralization precipitation of chromium ion is comparatively narrow (6.3~9.5) and the dosage must be controlled strictly when NaOH or CaO is used as regulator. Slight dissolution of carbonate minerals such as calcite (CaCO\textsubscript{3}) and magnesite (MgCO\textsubscript{3}) makes it possible that the solution has buffer pH which can match with the condition of neutralization precipitation of chromium ion. The hydroxide precipitation of Cr(III) occurs more easily in the interface area than in solution because the interfacial solubility product of Cr(OH)\textsubscript{3} formed on the surface of MgCO\textsubscript{3} ($K_{SP} = 10^{-33.56}$) is less than the solubility product in solution ($K_{SP} = 10^{-30.27}$). After the surface precipitation is formed, the dynamic electricity behavior of MgCO\textsubscript{3} becomes similar to that of Cr(OH)\textsubscript{3}. Using MgCO\textsubscript{3} as a purifier, the wastewater containing high concentration of chromium ion has been purified and advantages such as good purification effect, fast subsiding speed, and little sediment volume are manifested.

\textit{Keywords}: Carbonate mineral; Chromium ion; Wastewater treatment

*Corresponding author.