Calorimetric Measurements of Hydroxylamine Decomposition in the Presence of Transition Metals

Mieko Kumasaki
National Institute of Industrial Safety
1-4-6 Umezono Kiyose, Tokyo 204-0024, JAPAN
E-mail: miggy@anken.go.jp

Abstract
Hydroxylamine (HA), hydroxylamine chloride (HACl), and hydroxylamine nitrate (HAN) were each mixed with aqueous solutions of Cr$^{3+}$, Cr$^{6+}$, Mn$^{7+}$, Co$^{2+}$, Co$^{3+}$, and Cu$^{2+}$, and their heat flow profiles were monitored by a small-scaled reaction calorimeter, SuperCRC. These mixing tests demonstrated that HA was less reactive than HACl and HAN with Mn$^{7+}$ and Cr$^{6+}$. Their UV - Vis spectra confirmed that the substrates reacted along with a reduction of Mn$^{7+}$ and Cr$^{6+}$. HA was more reactive with Cu$^{2+}$ than HACl and HAN. HA exhibited the highest reactivity among the three substrates concerning the metals in the intermediate oxidation states: Cr$^{3+}$, Co$^{3+}$, and Co$^{2+}$. During the reaction of HA and Co$^{3+}$, an induction period was observed. All the exothermic reactions were accompanied by precipitation or a change in the UV - Vis spectra.