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Removal of NO with the hexamminecobalt(II) solution catalyzed by the activated carbon treated with acetic acid

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Abstract: The simultaneous scrubbing of NO and SO_2 can be finished with the $Co(NH_3)_6^{2+}$ ammonia solution. Activated carbon aids the regeneration of $Co(NH_3)_6^{2+}$ to retain the ability of absorbing NO. Acetic acid is tried to improve the catalytic capability of activated carbon. The best treatment condition is the carbon samples impregnated in 2.0 mol l^{-1} HAc solution for 20 h followed by being calcined at 600℃ for 4 h. The HAc modification increases surface area and acidic groups on the carbon surface. The experiments prove that the modified carbon can obtain a higher NO removal efficiency than the original carbon.

Keywords: activated carbon, catalysis, hexamminecobalt, nitric oxide, acetic acid

1 Introduction

The emission of NOx and SO_2 gives rise to much damage on ecological environment and human health, such as acidification, eutrophication, fog, ozone depletion, and loss of biodiversity. The expense consumed on halting and reversing environmental destruction caused by NOx and SO_2 is enormous in the past decade [1,2]. Therefore, it is crucial to develop cost-efficient methods to control the emission of NOx and SO_2. Many processes have been applied to remove these air contaminants from flue gases. Wet flue gas desulfurization(FGD)is the most popular technology used for SO_2 removal due to its excellent performance in commercial application. However, this approach is incapable of eliminating NOx since 90-95% of the NOx in typical flue gases is the water-insoluble nitric oxide(NO). As a result, some oxidation processes such as the use of H_2O_2, $NaClO_2$, $KMnO_4$, sodium persulfate, and sonochemical, have been tried to turn NO into soluble NO_2 [3-14]. Wen et al. [15] investigated the photocatalytic activity of the MoS_2-g- C_3N_4 nanocomposites for the removal of NO under visible light irradiation. Ye et al. [16] explored the photocatalytic performance of CuInZnS nanoporous structure for