PA19) Factors Affecting the Photodegradation of N-nitrosamines in Water

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1. Introduction

Postcombustion CO_2 capture using amine-based solvents is one of the emerging strategies to mitigate climate changes. However, formation of carcinogenic N-nitrosamines is the drawback of this technology (Chowdhury et al., 2013; Shah et al., 2013). Factors influencing the photodegradation treatment efficiency, including initial *N*-nitrosamines concentration, H_2O_2 dosageand, initial amines concentration, were evaluated.

2. Materials and Methods

A Cylindrical water jacketed glass batch reactor (i.d. 8.5 cm×L 15 cm) is designed to study the photodegradtion of N-nitrosamines under controlled conditions. The reactor is equipped with 4-W low-pressure Hg lamp (GL 4WP, UV Nature, Korea), a hot plate with a magnetic stirrer (HMS100, Yhana, Korea), a temperature controller (TZ4ST, Autonics, USA) with a K-type thermocouple, a fraction collector (2110, Bio-Rad, USA) for collection of samples at fixed intervals.

3. Results and Discussion

The decrease in pseudo-first-order photodegradation rate constants for NDELA, NDEA, and NMOR was observed from 1.53 to 0.34 min^{-1}, 1.04 to 0.30 min^{-1}, and 1.95 to 0.299 min^{-1} at 50^{-1} mg/L concentration, respectively. Photodegradation rate constant increased with increase in H_2O_2 dosage uptill specific concentration and then decreased. The maximum photodegradation rate constant was observed~20 molar ratio[H_2O_2]/[Nitrosamines]. The results showed that photodegradation rate constants decreased with increase in amines, concentration.

4. References

Chowdhury, F. A., Yamada, H., Higashii, T., Goto, K., Onoda, M., 2013, CO_2 capture by tertiary amine absorbents: A Performance comparison study, Ind. Eng. Chem. Res., 52, 8323-8331.

Shah, A. D., Dai, N., Mitch, W. A., 2013, Application of ultraviolet, ozone, and advanced oxidation treatments to washwaters to destroy nitrosamines, nitramines, amines, and aldehydes formed during amine-based carbon capture, Environ. Sci. Technol., 47, 2799-2808.