Statistical analysis of thermal and nonthermal effects of sequential microwave/aeration process for the removal of ammonia from aqueous solution

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ABSTRACT

The application of microwave (MW) radiation followed by aeration (A) for ammonia removal from synthetic solutions was investigated in this study. Results confirmed that the sequential microwave/aeration process was an effective approach for removal of ammonia from aqueous systems. Maximum ammonia removal of 81.7% for 100 mL synthetic solution was achieved by applying 650 W microwave radiation (50% of the maximum MW power output) over 120-s MW irradiation time followed by 10-minute aeration. One-way ANOVA tests and t-tests were conducted for the analysis of the differences in ammonia removal efficiencies among different methods. Among the three main contributions for the ammonia removal for the sequential microwave/aeration process (thermal effect, electromagnetic field (EMF) generated by MW radiation, and aeration process), the contribution of the EMF becomes increasingly significant with the increase of MW radiation time, except at a pH of 10. Under the optimum operation condition, the contribution of thermal process, EMF, and aeration was 39, 28, and 33%, respectively.

Keywords: Ammonia; Microwave; Aeration; ANOVA; t-test; Thermal; Nonthermal

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