

Inhibitory effects of ammonia and propionate on acetoclastic methanogens

Trong Hoan Do, Seung Gu Shin, and Seokhwan Hwang

School of environmental science and engineering, POSTECH, Pohang 790-784

TEL: +82-54-279-2282, FAX: +82-54-279-8299

Abstract

Failure of anaerobic digesters is often accompanied with high ammonia and propionate concentrations^{1,2)}. In this study, the effects of different combinations of ammonium nitrogen and propionate at different concentrations (2.0, 3.5, 5.0 g/L of ammonium nitrogen; 2.0, 5.0, 8.0 g/L of propionate) on acetoclastic methanogenesis were investigated in mesophilic batch digesters. Eleven batch digesters designed following a Box-Wilson faced central composite design with two independent variables were successfully carried out. An artificial medium with 12g/L of acetate was used as the substrate for acetoclastic methanogens. Methane production, chemical oxygen demand (COD) reduction and acetate concentration reduction were chosen as dependent variables. To determine the quantitative variations in acetoclastic methanogenic community, quantitative polymerase chain reaction (QPCR) was employed. Response surface analysis (RSA) on the experimental data resulted in good agreement with predicted values. Under the experimental conditions, the dominant population in all trials was *Methanosarcinaceae* whereas *Methanosaetaceae* was completely inhibited.

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