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Rodrigo Varas, Víctor Guzmán-Fierro, Elisa Giustinianovich, Jack Behar, Katherina Fernández, Marlene Roeckel

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Startup and oxygen concentration effects in a continuous granular mixed flow completely autotrophic nitrogen removal over nitrite reactor

Rodrigo Varas, Víctor Guzmán-Fierro, Elisa Giustinianovich, Jack Behar, Katherina Fernández, Marlene Roeckel*

Departamento de Ingeniería Química, Universidad de Concepción, Concepción, Chile

Casilla 160 C Correo 3, Concepción, Chile; mroeckel@udec.cl

Abstract

The startup and performance of the completely autotrophic nitrogen removal over nitrite (CANON) process was tested in a continuously fed granular bubble column reactor (BCR) with two different aeration strategies: controlling the oxygen volumetric flow and oxygen concentration. During the startup with the control of oxygen volumetric flow, the air volume was adjusted to 60 mL/h and the CANON reactor had volumetric N loadings ranging from 7.35 to 100.90 mgN/L·d with 36-71% total nitrogen removal and high instability. In the second stage, the reactor was operated at oxygen concentrations of 0.6, 0.4 and 0.2 mg/L. The best condition was 0.2 mgO₂/L with a total nitrogen removal of 75.36% with a CANON reactor activity of 0.1149 gN/gVVS·d and high stability. The feasibility and effectiveness of CANON processes with oxygen control was demonstrated, showing an alternative design tool for efficiently removing nitrogen species.

Keywords: oxygen effect; Anammox; CANON; autotrophic nitrogen removal

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