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A novel approach of modeling continuous dark hydrogen fermentation

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Abstract

In this study a novel modeling approach for describing fermentative hydrogen production in a continuous stirred tank reactor (CSTR) was developed, using the Aquasim modeling platform. This model accounts for the key metabolic reactions taking place in a fermentative hydrogen producing reactor, using fixed stoichiometry but different reaction rates. Biomass yields are determined based on bioenergetics. The model is capable of describing very well the variation in the distribution of metabolic products for a wide range of hydraulic retention times (HRT). The modeling approach is demonstrated using the experimental data obtained from a CSTR, fed with Food Industry Waste (FIW), operating at different HRTs. The kinetic parameters were estimated through fitting to the experimental results. Hydrogen and total biogas production rates were predicted very well by the model, validating the basic assumptions regarding the implicated stoichiometric biochemical reactions and their kinetic rates.

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