

AUTOTROPHIC DENITRIFICATION VIA A BIOFILM GROWING ON A GAS-PERMEABLE SILICONE TUBE

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Key Words : Autotrophic, denitrification, biofilm, nitrate, drinking water, silicone tube

ABSTRACT

Two gas-permeable silicone tube configurations were used to supply hydrogen to a laboratory-scale autotrophic denitrification bioreactor. Pure hydrogen gas flowed into the silicone tube and was transferred through the membrane wall to feed the biofilm on the tube's surface for denitrification. The biofilm directly used the hydrogen that diffused from the lumen side of the silicone tube as the energy source to reduce nitrate into nitrogen gas, thus increasing the hydrogen utilization efficiency (HUE) for denitrification. For the open-ended configuration, HUE was 1.8 % and could easily be increased by extending the silicone tube or using a gas circulation system. A high HUE (91.2 %) was then achieved for the dead-ended configuration. The nitrate in the treated water always attained the regulatory standard (10 mg NO₃-N/L) at a nitrate loading of 4.0 g/m²/day.