Organic matter effect in partial nitrification – anammox granules operated at low oxygenation: Diameter analyses

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The effect of organic matter on the metabolic, microbiological and physical properties of different diameter ranges of partial nitrification-anammox (PN-A) granular biomass obtained at low oxygen concentration was studied. Two different reactors were operated with and without organic matter as a substrate. Granular biomass was characterized with batch assays to determine the specific nitrification activity (SNA), the specific anammox activity (SAA), and the granule sedimentation rate. The relative abundance of the bacterial consortium was measured for each diameter range assayed. SNA exhibits a direct relationship with the specific surface of granules, which proves the importance of the outer layer in the nitrification process. With organic matter, the SNA decreased three times when diameter increased from 0.40 to 1.68 mm. The SAA shows different behaviors for both reactors: without organic matter, the SAA decreases at higher diameter ranges; whereas, with organic matter, the SAA increases at higher diameter ranges. This is mainly caused by the protection for oxygen penetration produced by the relative abundance increase of unidentified *eubacteria* in the granular biomass from 6.7 to 22%, without and with organic matter, respectively. The granular sedimentation rate increased with the diameter of the granules. The biomass SAA from a PN-A reactor can be predicted with an error of less than 11% only by knowing the distribution of the biomass diameters. These results are useful to evaluate the nitrogen abatement at industrial scale since the SNA and SAA activities can be predicted only through the granules diameters distribution of the reactor.