MONTANA STATE UNIVERSITY
NORM ASBJORNSON College of ENGINEERING

Tasnim Ritu

Masters Defense
Roberts 101
Tuesday, Nov. 29 2:00 to 3:00 pm

Department of Civil Engineering

The project assesses the performance of the aerobic granular sludge (AGS) to remove Poly-perfluoroalkyl substances (PFAS) and conventional nutrients like carbon, nitrogen, and phosphorus from synthetic wastewater in sequencing batch reactor (SBR). AGS is a novel microbial community that may be effective in reducing the PFAS from wastewater via sorption. PFAS are a class of man-made chemicals used as surfactants, fire retardants, and coating materials. PFAS compounds are very persistent in the environment and can lead to adverse health outcomes in humans. PFAS can migrate from consumer products and enter the influent of wastewater treatment facilities (WWTF). PFAS compounds are poorly removed by conventional wastewater treatment methods making effluent from WWTF a significant source of PFAS in the environment. The project uses two specific PFAS which are perfluorooctanoic acid (PFOA) and perfluoro octane sulfonate acid (PFOS). Other objectives of this project are to monitor how PFAS influences the treatment of conventional wastewater constituents and the granules' structure and morphology. Two SBRs were started with floccular sludge from seed granules and continued for 402 days. Some standard laboratory analytical methods for nitrogen, phosphorus, and organic carbon are used to monitor the removal efficiencies of the granules. Solid phase extraction (SPE) and liquid chromatography with mass spectrometry (UPLC with ESI Q-TOF-MS) are used to assess the removal of PFOA and PFOS both from liquid and sludge phases. Maximum removal of 33% for PFOS and 28% for PFOA has been achieved by AGS in SBR. PFOS/PFOA exposure affects the granule's structure and morphology at low dissolved oxygen (DO). PFOS/PFOA contamination has no significant effect on conventional nutrient removal except nitrification. Thus, the treatment of PFAS by AGS is economical, since AGS can treat several pollutants simultaneously in a single reactor. More research should be done on the disposal of PFAS-contaminated sludge and to increase the treatment efficiency.

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