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Heavy metals in the environment: Its influence on anaerobic sewage sludge stabilisation

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The work is focused on the impact of heavy metals on anaerobic sewage sludge stabilisation process, thus biogas production and quality. Primary source of heavy metals in urban wastewater is industry, which represents up to 50% of the total heavy metal content in sewage sludge. Domestic sources are mainly associated with leaching from plumbing materials, gutters and roofs, galvanised materials, the use of detergents and washing powders, and the use of body care products. Anaerobic sewage sludge stabilisation is a complex microbiological process involving various types of anaerobic and facultative anaerobic bacteria. This way of sludge treatment involves degradation and the stabilisation of organic matter, with reduction in odour, pathogens and the mass of solid organic material that requires further processing. This is accomplished by the biological conversion of organic matter to methane (CH₄) and carbon dioxide (CO₂). Sludge samples were collected directly from the anaerobic sewage sludge stabilisation tank located at the wastewater treatment plant (WWTP) in Brno, Czech Republic, population equivalent (PE) 513,000. Biogas production and quality was measured using batch anaerobic fermenters with the volume of 5 dm³ at the temperature 38°C±0.2°C. Into fermenters five different amounts of heavy metals (Cu, Zn) were added. Cumulative biogas and methane production were used as the comparative parameters of tested metals inhibitory effect. Hypothesis, which predicts presence of inhibitory effect of zinc and copper on anaerobic microorganisms, mainly on methanogenic archaea, was confirmed. The lowest concentration of zinc and copper which causes significant inhibition of biogas production is 400 mg Zn²⁺·l⁻¹ and 1000 mg Cu²⁺·l⁻¹, which cause reduction of 10.3±2.0% and 82.8±1.1%, respectively.

Biography

Vitez T has completed his PhD in 2004 at Mendel University in Brno. He completed his Habilitation at 2014 at Mendel University in Brno and has specialization in Waste Management. He is Head of the National Biogas Laboratory, member of Czech Water Association. He is focused on waste management, anaerobic technology and wastewater treatment.

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