Institute of Chemical Engineering

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Laboratory of Bioreactor and Biocatalytic Process

Head

dr hab. inż. Anna Gancarczyk, professor of the institute

Staff

dr inż. Agnieszka Gąszczak, assistant professor

dr inż. Anna Szczotka, research and technical specialist

mgr inż. Elżbieta Szczyrba, research and technical specialist

Current research activities

Biodegradation of plastics

The research aims to identify and characterize bacterial strains exhibiting high plastic-degrading capability. The work focuses on employing biological processes as an environmentally friendly alternative to conventional polymer disposal methods. New bacterial strains are isolated from soil samples contaminated with polymer waste and selected for their ability to grow under conditions where the plastic serves as the sole source of carbon and energy. The isolated microorganisms undergo detailed morphological and biochemical analyses to assess their metabolic potential. Experiments are conducted to evaluate the capacity of these strains to degrade polymers. The extent of plastic degradation is assessed using a complementary set of analytical methods, including measurements of sample mass loss, surface wettability analysis, scanning electron microscopy (SEM), and Fourier-transform infrared spectroscopy (ATR-FTIR).

Biological methane oxidation

Climate change is among the most pressing challenges of our time, with anthropogenic greenhouse gas emissions being a major contributing factor. Global atmospheric methane levels continue to rise, and diffuse, surface-level emissions—such as those from landfills and abandoned mines—remain a significant concern. In large areas where methane is emitted at low to moderate levels, biological

approaches offer a cost-effective and environmentally sustainable solution. The potential of methanotrophic bacteria is harnessed, as these microorganisms metabolically convert methane into less harmful compounds. While this microbiological process occurs naturally in the environment, emerging technologies aim to significantly accelerate it, enhance its efficiency, and enable its large-scale application. Current research focuses on developing consortia of methanotrophic bacteria with high effectiveness in reducing environmental methane concentrations, as well as on designing technologies for their implementation in the bioremediation of post-mining areas. The ultimate goal of these studies is the substantial reduction of methane emissions, thereby restoring the land to its former utility and enabling its sustainable redevelopment.

Metryczka

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