Hybrid Event
11th World Conference on
Climate Change
14th World Congress and Expo on
Recycling
October 19-20, 2022
Barcelona, Spain

Biodegradability of cellulose (Cell)- and polybutylene succinate (PBS)-based materials under anaerobic and aerobic conditions

M. Zaborowska, K. Bernat and **D. Kulikowska**
University of Warmia and Mazury in Olsztyn, Poland

The implementation of guidelines for a circular economy, as well as a shortage of fossil resources, has caused a dynamic development of the bio-based materials market, which is related to the appearance of waste from these materials in existing waste management systems. Possible end-of-life scenarios for bio-based materials are recycling (organic, mechanical, chemical), or incineration. However, because the materials are labelled biodegradable, organic recycling should be a priority. Because organic recycling is defined as biological anaerobic and aerobic treatment of waste, both of these methods were used for determining the possibilities of biodegradation of Cell- and PBS-based materials.

Biodegradation was carried out at 55°C under both anaerobic and aerobic conditions. Under aerobic conditions, with a mature compost from bio waste as the inoculum, the biodegradability of these materials was determined based on oxygen consumption. Under anaerobic conditions, however, with the inoculum in the form of fermented sludge, the biodegradability was assessed based on methane production. During aerobic and anaerobic degradation, microscopic changes on the surfaces of the materials and the mechanical properties of the materials (based on the tensile test) were also observed.

Initially, both materials were transparent and smooth. Under anaerobic conditions, the mechanical properties of the Cell-based material were lost after 3 days, after which it was not possible to perform the tensile test. The material became severely weakened and fragile and was not visible in the inoculum after 4 days. The PBS-based material was more resistant to biodegradation: it lost its mechanical properties after 14 days, after which it was not visible in the inoculum.

Under aerobic conditions, the Cell-based material changed colour to light-yellow and lost its mechanical properties after 1 day, then it became fragile and crumbled when touched. After day 5, it was no longer visible in the compost. Under aerobic conditions, the PBS-based material lost its mechanical properties after a shorter time (7 days) than under anaerobic conditions. After this, the material fragmentated. It was visible until 14 days of biodegradation.

In conclusion, the results of this study indicate that Cell-based material is more susceptible to biodegradation than PBS under both aerobic and anaerobic conditions.

Biography

Prof. M. Zaborowska Department of Environmental Biotechnology, Faculty of Geoengineering at University of Warmia and Mazury in Olsztyn, Sloneczna 45G, 10-709 Olsztyn, Poland

Received: August 12, 2022; **Accepted**: August 14, 2022; **Published**: October 05, 2022