

<https://doi.org/10.7250/CONNECT.2023.130>

# EXPERIMENTAL EVALUATION OF CARRIER MATERIALS: A NEW WOOD ASH FILTER MATERIAL COMPARISON WITH OTHERS USED FOR EX-SITU BIOMETHANATION

Zane KUSNERE<sup>1\*</sup>, Diāna RUPEIKA<sup>2</sup>, Kriss SPALVINS<sup>3</sup>, Taras MIKA<sup>4</sup>

<sup>1-4</sup> Institute of Energy Systems and Environment, Riga Technical University, Āzenes iela 12/1, Riga, LV-1048, Latvia

\* **Corresponding author.** Email address: zane.kusnere@rtu.lv

**Abstract** – Biomethanation is a prospective method to integrate a renewable solar or wind power grid with a biogas grid, where excess energy can be used to produce hydrogen for the biomethanation of the biogas and produce biomethane. The use of biotrickling filter reactors with appropriate carrier materials for biomethanation is essential for the immobilisation of hydrogenotrophic methanogens on the surface of the packing material. Wood ash filter material use end-of-the-line waste ash as the main raw material for the production of filters. The wood ash filter material is a robust porous material that has good properties in the context of biomethanation. Testing packing materials in constantly operating biotrickling filter reactors would cost too much time and money. The purpose of this study is to compare a novel wood ash filter material with materials that are often applied in the sector. The study uses an effective methodology to test three alternative packing materials for use in a biotrickling filter. The manometric method and BMP test is used to determine the rate of CH<sub>4</sub> production. The physical parameters such as bulk-specific surface area (m<sup>2</sup> × m<sup>-3</sup>), external porosity (% vol), and bulk density (kg × m<sup>-3</sup>), and chemical composition of the novel wood ash filter material are compared to other filter materials commonly used in biomethanation applications. The results of the experiment determine whether the novel wood ash filter material or other tested materials can compete with and even replace some of the materials currently used in biomethanation applications.

**Keywords** – Biogas upgrading; biomethanation; biotrickling filter; carrier materials; filter material; methanogenesis; reactor; wood ash

