

## Plasma Treatment of a Lignite Using Water-Stabilized Plasma Torch at Atmospheric Pressure

**Authors :** Anton Serov, Alan Maslani, Michal Hlina, Vladimir Kopecky, Milan Hrabovsky

**Abstract :** Recycling of organic waste is an increasingly hot topic in recent years. This issue becomes even more interesting if the raw material for the fuel production can be obtained as the result of that recycling. A process of high-temperature decomposition of a lignite (a non-hydrolysable complex organic compound) was studied on the plasma gasification reactor PLASGAS, where water-stabilized plasma torch was used as a source of high enthalpy plasma. The plasma torch power was 120 kW and allowed heating of the reactor to more than 1000 °C. The material feeding rate in the gasification reactor was selected 30 and 60 kg per hour that could be compared with small industrial production. An efficiency estimation of the thermal decomposition process was done. A balance of the torch energy distribution was studied as well as an influence of the lignite particle size and an addition of methane (CH<sub>4</sub>) in a reaction volume on the syngas composition (H<sub>2</sub>+CO). It was found that the ratio H<sub>2</sub>:CO had values in the range of 1,5 to 2,5 depending on the experimental conditions. The recycling process occurred at atmospheric pressure that was one of the important benefits because of the lack of expensive vacuum pump systems. The work was supported by the Grant Agency of the Czech Republic under the project GA15-19444S.

**Keywords :** atmospheric pressure, lignite, plasma treatment, water-stabilized plasma torch

**Conference Title :** ICSRD 2020 : International Conference on Scientific Research and Development

**Conference Location :** Chicago, United States

**Conference Dates :** December 12-13, 2020