

The application of thermal plasma for the treatment of soil polluted by bitumen

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Keywords: bitumen, soil treatment, thermal plasma, hazardous waste management

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Abstract

Petroleum hydrocarbons are the most frequently found organic pollutant in the environment. Additionally, oil spills or leakage appearing during its extraction, transportation, or other anthropogenic activities causes aquatic and terrestrial environment contamination and negatively impacts living beings. Thus, the treatment of these pollutants from contaminated sites (e.g. soil) is highly required. Hence, fast and effective soil treatment methods are being searched to prevent adverse environmental outcomes. Consequently, this experimental research aimed to investigate the thermal plasma ability to treat soil contaminated by bitumen. It was found that bituminous soil surface morphology changed after treatment with thermal water vapor plasma or thermal air plasma. Before the treatment process, the soil had a relatively smooth surface, metallic brightness, and spherical particles – a feature of bitumen. After interaction with thermal plasmas, the soil became relatively rougher and had a granular structure – a feature of clean soil. Further, the soil elemental composition evaluation revealed that carbon and sulfur content in the soil decreased after treatment in the plasma environment. Moreover, H₂, CO and CO₂ were the leading gases generated during the bituminous soil treatment process. Also, it was revealed that both thermal plasmas are capable of treating bituminous soil.

Keywords

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