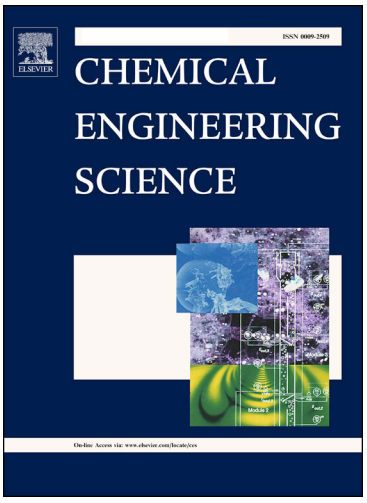

Bio-combustion of petroleum coke: The process integration with photobioreactors

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Bio-combustion of petroleum coke: The process integration with photobioreactors

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Abstract: The objective of this study is to develop a bio-combustion system integrated into a photobioreactor. Different oxidizers (a simulated industrial gas stream containing 5.5% O_2, 18% CO_2 and 76.5% N_2, the atmospheric air and the photobioreactor exhaust gases in different residence times) were injected into the combustion chamber, and combustion temperature, combustion stability, heating rate, and fuel conversion were analyzed. The results have shown that the use of photobioreactor exhaust gases as oxidizer, biofuel, and nitrogen diluent in the combustion furnace, have increased the thermal efficiency of the system, with heating rates 30.5% and 45.8% higher than the atmospheric air and the simulated industrial gas stream, respectively. Thus, the integration of these processes could be considered a viable strategy to improve the combustion systems thermal performance, efficiently contributing to the sustainability and economy of industrial operations.

Keywords: biological carbon capture and utilization, combustion, microalgae, carbon dioxide, greenhouse gas.

1. Introduction

The continued growth in anthropogenic emissions of air pollutants, from burning fossil fuels, has become an issue of concern due to their adverse effects on the environment, particularly related to the carbon dioxide (CO_2), a