

## **COAL GASIFICATION TESTS WITH CO<sub>2</sub> AS GASIFICATION AGENT. FIRST RESULTS OF THERMAL ANALYSIS ON SULCIS AND SOUTH-AFRICAN COAL.**

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The use of CO<sub>2</sub> as gasification agent opens new interesting prospects in relation to the gasification of coal or co-gasification of coal and biomasses. This technology not only could increase the efficiency of carbon conversion but also can generate a syngas basically constituted of carbon monoxide, hydrogen, carbon dioxide and water vapour that in the case of oxy-combustion achieve to carbon dioxide and vapour formation. Such type of combustion gas may be then easily separated by water condensation. Several power plant configurations have been recently studied as an alternative to conventional technologies in the field of energy systems equipped with carbon capture and storage technologies (CCSs). Clearly, understanding the gasification reaction mechanisms and reactivity is important in terms of gasifier design and operation. The paper proposes an experimental approach to the analysis of coal gasification that uses CO<sub>2</sub> as gasification agent as a first step towards commercial application of this technology.

The work investigates on the reactivity in carbon dioxide of chars obtained from the pyrolysis of two different coal, Sulcis and South African, by thermogravimetric analysis (TGA). The gasification tests were carried out at different temperatures, under CO<sub>2</sub> atmosphere, and a kinetic analysis of coal gasification rate has been implemented by fitting the experimental data with nth-order, respect to the solid, kinetic model. Experimental data obtained for the whole range of experimental conditions explored were satisfactorily described by a single kinetic model showing a 0,99 linear regression fit with greater reactivity achieved by the Sulcis coal.

Keywords: coal gasification, thermogravimetric analysis, co<sub>2</sub>, bouduard reaction