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## *Simulation of a CO<sub>2</sub> absorption process in a laboratory-scale coal-to-hydrogen plant*

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### **Abstract**

Nowadays, the increase in energy demand and the interest in the environment preservation, have improved the attention toward hydrogen production through coal gasification, owing to the remarkable advantages offered by this technology in pollution control. Moreover, carbon dioxide capture and storage (CCS) is currently being more and more interesting due to the need of reduce the greenhouse gases emissions worldwide. In particular, as a consequence of the implementation of the Kyoto Protocol, the application of CCS technologies in the power generation field strongly influences the economical and financial balance of each plant.

To this aim, Sotacarbo is studying an innovative integrated CO-shift and CO<sub>2</sub> absorption process, which will be tested in the Sotacarbo coal-to-hydrogen experimental plant. In particular, CO<sub>2</sub> absorption takes place with an amine-based solvent in an innovative bubbling reactor.

This paper describes a detailed simulation model, implemented by using Matlab software, developed in order to evaluate the performances of the CO<sub>2</sub> absorption process and to plan the tests on the experimental plant. In particular, a continuous stirred tank flow (CSTF) model has been assumed to describe the reactor fluid-dynamic and the absorption phenomena has been studied by making use of the film theory to describe the liquid side mass transfer of carbon dioxide.

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