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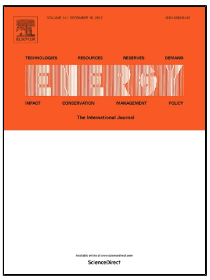

A New Model for Evaluation of Cavity Shape and Volume during Underground Coal Gasification Process

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ABSTRACT

Coal seams are converted to syngas by advanced thermo-chemical processes through Underground Coal Gasification (UCG) method. Inability to predict the shape and volume of the underground cavity is an important scientific gap in UCG method which is the main subject of this paper. For this purpose, firstly, a series of equations are introduced to predict the cavity growth dimensions over time. Subsequently, these equations are extended in numerical simulation of the Computational Fluid Dynamics (CFD), incorporating the commercial COMSOL software. According to the simulation, the amount of oxidant necessary to convert a certain amount of coal (in the heterogeneous phase) is calculated. The model results indicated that the shape and volume of cavity could be predicted at the onset of the gasification process. The numerical results agreed well with the field data.

Keywords: Underground Coal Gasification (UCG); cavity shape; cavity volume; Computational Fluid Dynamics (CFD); COMSOL

1. INTRODUCTION

Coal is an important source for power generation, currently supplying 41% of the global electricity demand. Also significant quantities of coal are employed in metallurgical processes, gasification, and cement industries as well as raw materials for activated carbon and some other industrial purposes