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SUSTAINABLE ENERGY
THE EARTH INSTITUTE AT COLUMBIA UNIVERSITY

Coal-based clean energy systems and CO₂ sequestration

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Mining Engineering (Colorado), vol. 56

October 2004

Abstract (Summary)

As the environmental concerns related to fossil fuel utilization increase, coal mining and power generation from coal-fired power plants are becoming subject to increased criticism. However, coal is a vital component in the energy mix and will likely remain so because of the vast global resources and extremely low cost of production. Environmental concerns over emissions from coal-fired power plants will need to be addressed to make coal a truly sustainable energy source for the next century and beyond. In addition to particulate matter, sulfur dioxide (SO₂), nitrogen oxide (NO_x) and carbon dioxide (CO₂) emissions have also become a global issue. Among all fossil fuels, coal is the largest contributor of CO₂ emissions per unit of energy produced and is one of the major contributors of anthropogenic CO₂. In this paper, the authors focus on new technologies that will lead to emission-free systems of power generation based on coal and other hydrocarbons. The fundamental principle is to convert the chemical energy of carbon in coal or other hydrocarbons to hydrogen by chemical processes where no emissions to the air, including emissions of CO₂, are produced.