

STUDIES ON THE KINETICS OF MICROBIAL DESULPHURISATION OF COAL

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CERTIFICATE

We are satisfied that the thesis entitled "**Studies on the Kinetics of Microbial Desulphurisation of Coal**" submitted by **Mr. Apurba Dey** is worthy of consideration for the award of the degree of **Doctor of Philosophy** and is a record of the original bonafide research work carried out by him under our guidance and supervision and that the results contained in it have not been submitted in part or full to any other University or Institute for the award of any degree.

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ABSTRACT

Coal is considered as one of the major energy source throughout the world. The main limitation in using coal for various activities lies in its high sulphur content. Sulphur from coal can be removed by biological means and it has significant advantages over the chemical and physical methods.

Thiobacillus ferrooxidans is the most widely used microorganism for the removal of sulphur from coal. Various steps are involved in the overall desulphurisation process by this organism and in order to develop an economically viable process, the individual steps should be thoroughly investigated.

In this work the two major steps involved in coal desulphurisation process, namely, growth of the organism on ferrous sulphate and the adsorption of the cells on to coal surface were investigated. Also some kinetic studies on the overall desulphurisation process was carried out under controlled conditions.

The studies showed that growth kinetics of *Thiobacillus ferrooxidans* can be expressed in simple exponential form. Aeration and supplementing inlet air with carbon dioxide enhanced the growth rate and the yield of the organism. Adsorption studies showed that the process is extremely rapid and its kinetics can be modelled as an irreversible process. It also confirmed the preferential adsorption of the cells to the coal surface. Coal desulphurisation studies showed that the organism can remove major portion of inorganic sulphur in about ten days time. However, it failed to remove organic sulphur. Modelling of the processes showed that the rate of desulphurisation is controlled by the exposed surface area of the coal.

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