National Institute of Technology Rourkela

Progress Seminar

Seminar Title	: PORE CHARACTERIZATION FOR GAS TRANSPORT AND RECOVERY IN COALBED METHANE RESERVOIRS
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Venue	: Seminar Room, Mining Engineering Department
Date and Time	: 02 Jun 2025 (4_00 PM)
Abstract	: CBM (Coalbed Methane), an unconventional natural gas resource, relies heavily on the intricate network of coal matrix pores for gas storage and flow. Characterization of pore structures in CBM reservoirs enhances the understanding of gas transport and recovery processes. Effective characterization of these pores is crucial for optimizing production strategies and maximizing recovery rates. Various techniques, including low-pressure N_2 & CO_2 adsorption, sorption isotherm measurement, scanning electron microscopy (SEM), etc., are employed to analyze pore size distribution, connectivity, and surface characteristics within coal samples. Previous studies on gas adsorption in coal have yielded inconclusive findings regarding its correlation with chemical properties, coal type, and coal rank. Variations in adsorption behavior across different coal samples suggest that multiple factors, including mineral composition, pore structure, and organic matter content, influence the adsorption process, leading to discrepancies in reported results. Depending on the coalification process, the pore shape, size, and pore volume within the coal throughout the reservoir are difficult to assess. To investigate the factors influencing CBM recovery, adsorption isotherm characteristics of methane and CO_2 have been studied on Indian coals. The adsorption rate and diffusion data are also analyzed with the adsorption isotherm. SEM analysis of coal samples has been carried out to visualize pore shapes present in the sample. The diffusion Unipore model has been fitted with experimental data, but this model failed to predict the experimental adsorption kinetics data for the entire time range. Therefore, a modified diffusion model incorporating elements of both the unipore and bidisperse diffusion frameworks will be developed to characterize gas transport mechanisms within the coal matrix by accounting for variations in pore size distribution and transport dynamics within coal structures. This detailed pore characterization study will enhance the understanding of the intricate relationship between pore structure and gas transport mechanisms in coal reservoirs. The findings will serve as a foundation for optimizing reservoir management strategies in CBM extraction, facilitating improved gas recovery efficiency and sustainable resource utilization