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Insights of CBM Produced Water Composition Influenced by Rock Interaction and Seasonal Variations in Raniganj Coalfield, India

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Abstract

An investigation has been carried out at Raniganj coalfield for the insights of Coal Bed Methane (CBM) produced water compositional changes during advancement of methane production including the influence of rock dissolution and water-rock interaction. The high concentrations of Na^+ and HCO_3^- is sourced from multiple geo-controlled activities like dissolution of carbonate minerals, conversion of organic matter to $CO_2$and water-rock interaction processes due to change in pH. The concentration of Cl^- is relatively stable in produced waters but HCO_3^- concentration varies drastically due to saturation of k-feldspar, kaolinite and auxiliary silicate weathering into clays, ultimately producing higher concentrations of HCO_3^- ions. The F^- ion seems to be sourced from parent rock granite and its associated minerals like biotite, amphibole, apatite and fluorite. The high content of TDS is principally contributed by Na^+ and HCO_3^- ions, results in high SAR values, suggesting non-suitability of produced water for irrigation use. The determined water quality index (WQI), indicates non-suitability of produced water for any use. It is observed that the ion exchange and reverse osmosis can make the produced water drinkable. Moreover, the empirical sodium bicarbonate ratio (SBR) has been proposed to designate the suitability of produced water for different uses. The results of SBR have been validated by correlating with the SAR and Kelley's index.

Keywords: Coal bed methane, Produced water, Chemical composition, Sodium bicarbonate ratio, Rock-interaction, Utilisation options.