**Effect of CO2 Injection on Reservoir Rock Properties**

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**Abstract**

This study aims to experimentally investigate the reservoir rock samples after injection of anthropogenic carbon dioxide. Petrophysical and Mineralogical investigations will be carried out before and after exposing the reservoir core samples along with synthetic formation brine in CO2 in a high-pressure vessel. Change in physical properties like porosity, permeability and chemical properties influencing injectivity, storage capacity as well as future possibility of injecting CO2 as a long-term safety measure will monitor. XRD, thin section analysis will also be done in the sample before and after the injection to investigate the mineralogical changes. The study also aims to measure the contact angle of the samples using sessile drop method before and after the injection of Carbon Dioxide. Solubility and Mineral trapping of CO2 also contribute enough to measure the storage capacity of the reservoir. Thus, mineral storage capacity will be established from the mineral content of reservoir rock i.e., XRD data and numerical calculations. In addition, the storage capacity of the reservoirs by CO2 solubility in formation brine and residual oil will be evaluated similarly.

In this study the core samples were collected from Lower Barail Sand 5 field of Assam Basin. The core plug was divided into 3 parts of which the core size of .9 cm was used to measure the contact angle i.e., wettability before and after the injection. And the sample which was used for XRD and thin section grinded in a motor and pestle and sieved with mesh size 200-230 ASTM. Broken fragments were selected for the study and split into two subset 1 (untreated) which is used to describe initial minerology and subset 2 (CO2 treated) use for long term CO2 experiments. They are taken in such a way that there should be minimum heterogeneity between them. For 2 months the samples were stored together with synthetic reservoir brine and anthropogenic CO2 in high quality in high quality steel pressure vessels that were placed in a heating cabinet at simulated reservoir conditions. The setup helps to determine petrophysical parameters of the rock, changes in the mineral and structural compositions, and physiochemical alterations of brine were analysed. Table 1 shows some data of LBS 5 provided for the empirical calculations of the solubility and mineral trapping capacities of the reservoir rock.

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**Table 1**: Reservoir and fluid data of an Assam oilfield

|  |  |
| --- | --- |
| Original oil in place, Nooip | 4.2 mMt |
| API Gravity | 35 |
| Original oil volume factor, Boi | 1.74 |
| Specific gravity | 0.853 |
| Oil recovery factor, Ro | 29.2% |
| Bubble point pressure, Pb | 250 ksc |
| Pinitial ­& Ppresent | 356 ksc and 160 ksc |
| Reservoir Temperature | 100 ℃ |
| Depth | 3400 m |
| Density of Crude in the ground | 0.835 g/cc |
| Original Oil saturation, Soi | 50% |
| Porosity | 13-18% |
| Permeability | 4-32 mD |

After injecting and reviewing the core samples the mineral and solubility trapping capacities are determined by the empirical calculations provided in Shuaiwei Ding, 2018. CO2 storage capacity estimation in oil reservoirs by solubility and mineral trapping. Table 2 shows the trapping capacities of the reservoir rock:

**Table 2**: Estimated CO2 trapping potential of reservoir rock of Assam oilfield

|  |  |  |
| --- | --- | --- |
| **CO2 storage capacity (Mt)** | **Trapping Mechanism** | **Average Value** |
| Solubility in remaining oil | 2.587 |
| Solubility in formation water | 0.5575 |
| Mineral trapping | 17.1652 |

Keywords: CO2 storage, Carbon dioxide injection, solubility-mineral trapping