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Data article

Dataset on experimental investigation of gum arabic coated alumina nanoparticles for enhanced recovery of nigerian medium crude oil

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A R T I C L E I N F O

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A B S T R A C T

The dataset in this article are related to an experimental Enhanced Oil Recovery (EOR) scheme involving the use of dispersions containing Gum Arabic coated Alumina Nanoparticles (GCNPs) for Nigerian medium crude oil. The result contained in the dataset showed a 7.18% (5 wt% GCNPs), 7.81% (5 wt% GCNPs), and 5.61% (3 wt% GCNPs) improvement in the recovery oil beyond the water flooding stage for core samples A, B, and C respectively. Also, the improvement in recovery of the medium crude oil by the GCNPs dispersions when compared to Gum Arabic polymer flooding was evident in the dataset.

Specifications Table

Subject area	*Petroleum Engineering*
More specific subject area	*Enhanced Oil Recovery/Tertiary Oil Recovery*
Type of Data	*Tables and Figures*
How Data was Acquired	*Core Flooding Experiment using the OFITE® Reservoir Permeability Tester*

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Data Format	*Raw Data*
Experimental Factors	1. *GCNP preparation using Al_2O_3 nanoparticles and Gum Arabic* 2. *Core plugs were cleaned with acetone using the Soxhlet apparatus* 3. *Saturation of the plugs were done using Vinci Technologies® High Pressure Core Saturator* 4. *Core flooding of the plugs using OFITE® Reservoir Permeability Tester at different flow rates for waterflood and GCNP*
Experimental Features	*Improvement in recovery of the medium crude oil by the GCNPs dispersions when compared to water or Gum Arabic polymer flooding*
Data Source Location	*Department of Petroleum Engineering, Covenant University, Nigeria*
Data Accessibility	*Data is with the article*

Value of data

- Core flooding results show the relevance of polymer coated nanoparticles for the recovery of crude oil from conventional reservoirs.
- The GCNPs provided improved recovery of oil beyond the capacity of water flooding and polymer flooding.
- Incremental oil recovery over that of waterflooding was encouraging despite permeability impairment by about half the initial measured value.
- The results obtained calls for a detailed study on the mechanisms at play with respect to the polymeric and surfactant property of Gum Arabic. Likewise, the performance of Gum Arabic should be evaluated and compared to that of known and standard polymers used in the industry.

1. Data

Nanoparticles are reported in [1–3] to improve oil recovery but its instability paved the way for stable polymer coated nanoparticles [4]. The dataset presented in this paper provides an experimental investigation of Gum Arabic coated Alumina Nanoparticles (GCNPs) for enhanced recovery of Nigerian medium crude oils. Gum Arabic is a naturally occurring polymer that is abundant in Nigeria and Sudan. Table 1 shows the properties of the various cores, inclusive of the impact of GCNPs flooding on permeability causing impairment of the cores. Table 2 shows the results for the determination of connate water saturation in the cores after the oil injection process. Table 3 gives values for the residual oil saturation and recovery factors after water flooding. Table 4 gives the additional oil recovery obtained using GCNPs and the irreducible oil saturation. Whereas Fig. 1 displays graphically, the impact of the incremental oil recovered by GCNPs after the optimal recovery by the waterflooding process. The dataset for Fig. 1 is presented in Table 5.

Table 1
Rock properties of the Berea cores. The effect of the GCNPs on the absolute permeability are captured in the last two columns.

Core samples	Length (cm)	Diameter (cm)	Bulk volume (ml)	Wet weight (g)	Dry weight (g)	Pore volume (ml)	Porosity (%)	Absolute K (Pre flooding) (mD)	Absolute K (Post flooding) (mD)
Core A	6.30	3.7	67.77	165.3	151.2	12.48	18.41%	262.3	125.8
Core B	6.25	3.7	67.23	165.1	151.0	12.48	18.56%	278.8	115.4
Core C	6.30	3.7	67.77	164.7	151.0	12.12	17.89%	251.7	173.2
Core D	6.25	3.7	67.23	165.2	151.9	11.77	17.51%	245.0	223.7