

# Functional Nanoparticle-Augmented Surfactant Fluid for Enhance Oil Recovery in Williston Basin

## Submitted by:

Department of Petroleum Engineering,  
Department of Chemistry, Institute of Energy  
Studies – University of North Dakota

Request for: \$769,134; **Revised: \$678,932**

Total Project Costs \$1,724,006; **Revised: \$1,439,810**

Duration: 3 years

# PROJECT DESCRIPTION

- The objective of this project is to develop a novel nanoparticle enriched surfactant fluid for enhanced oil recovery (EOR) in Williston basin. In this fluid, the nanoparticles will carry surfactant to deeply penetrate rock matrix, then effectively displace oil locked in micro- and nano-pores of tight rocks, and finally carry the oil out of the rocks. The features of the designed nanoparticles will be: 1) controllable delivery of surfactant and alter the wettability of interfaces of oil with the fluid; 2) high mobility, water solubility, stability, and uniform dispersion in the reservoir fluids; 3) tunable chemical composition, shape, size, porosity and functionality; 4) environmentally friendly; and 5) low cost. The commercialization of this technology will lead to higher oil recovery, prolonged reservoir life, reduced operation cost and further minimizing the environmental complications.
- The results will provide conceptual validation of nanoparticle loaded surfactant fluid for EOR in Bakken tight formation. Vital data will be collected based on the fluid performance regarding their wettability, mobility and the effects of EOR in the Bakken play from macro- to nanoscale levels. Positive recovery rates are expected. Accumulated data, mechanisms and optimization outcomes will lay a solid foundation to the technology's commercialization in the near future.

# TECHNICAL REVIEWERS' RATING SUMMARY

## Technical Reviewer

Statement	Weighting Factor	Technical Reviewer			<u>Average Weighted Score</u>
		<u>G-41-01A</u>	<u>G-41-01B</u>	<u>G-41-01C</u>	
Objectives	9	4	5	4	36
Achievability	7	4	4	4	28
Methodology	8	4	5	4	32
Contribution	8	4	3	4	24
Awareness / Background	5	5	4	4	20
Project Management	3	4	4	4	12
Equipment / Facilities	2	3	4	4	6
Value / Industry- Budget	4	3	4	4	12
Financial Match – Budget	4	2	3	4	12
Average Weighted Score		191	205	200	198
Maximum Weighted Score		250 possible points			

# TECHNICAL REVIEWER TOTALS

- ◎ G-41-01A

Average Weighted Score: **191 out of 250**

**FUNDING TO BE CONSIDERED**

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- ◎ G-41-01B

Average Weighted Score: **205 out of 250**

**FUND**

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- ◎ G-41-01C

Average Weighted Score: **200 out of 250**

**FUND**

# DIRECTOR'S RECOMMENDATIONS

- **To fund the direct expenses only in the amount of \$678,932.**
  - (Note: Funding is recommended for salaries and fringe benefits of 3 faculty members for work on this project they will do outside their 9-month calendar year contract and for the salaries and fringe benefits of 1 post-doc student and 3 research students along with project operating costs.)