



IIT MADRAS

Indian Institute of Technology Madras

Technology Transfer Office
TTO - IPM Cell



Industrial Consultancy & Sponsored Research (IC&SR)

COMPOSITION & PROCESS FOR ENHANCED OIL RECOVERY

IITM Technology Available for Licensing

Problem Statement

- In the present era, **reduction of interfacial tension** is one of the crucial parameter in the field of petroleum engineering to enhance the production of trapped residual crude oil in the classic reservoir.
- Several studies noted that **IFT does not reduce significantly** with an increased temperature & salinity of the crude oil/water system during IFT measurement with an addition of conventional surfactants including other issues.
- Hence there is a need of eco-friendly process for increasing the residual oil production.

Technology Category/ Market

Technology: Composition & process for enhanced oil recovery; **Industry/Application:** Oil & Gas, Manufacturing/Chemical.

Market: The global oil & gas separation equipment market size is growing at a **CAGR of 7.1%** during **2024-2030**.

Technology

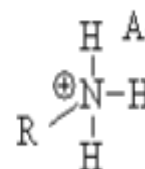
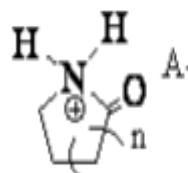
Present invention describes a **composition for extracting hydrocarbons** from a subterranean reservoir containing **hydrocarbons**, comprising:

(a) **an ionic liquid**, wherein the ionic liquid is selected from the group of lactam, ammonium, hydroxyl ammonium, imidazolium, pyridinium, quinolidinium, isoquinolidium, and combinations thereof, wherein the **ionic liquid** has a concentration in the range of **10 to 100000 ppm**,

(b) **water**, and

(c) salt, wherein the salt is an **alkali metal salt**, and has a concentration in the range of **50 to 500000 ppm**,

- wherein the ionic liquid is selected from the group comprising of



and combinations thereof, wherein n is 0 to 10; A is a negatively counter anion.

- R is C1-16 alkyl, wherein alkyl is optionally substituted with 1-4 substituents selected from the group of hydroxyl, nitro, halogen, -OR1, -COOR1, C1-6 alkyl, C5-10 aryl, C3-10 heteroaryl, wherein R1 is selected from the group of hydrogen, C1-16 alkyl, and C6-10 aryl, wherein alkyl and aryl are optionally substituted with hydroxyl, nitro, halogen, alkyl, and aryl.
- Further, said application describes a **method of recovering and/or extracting hydrocarbons** from a subterranean reservoir containing hydrocarbons using the said composition.

Intellectual Property

IITM IDF Ref. 1263; Patent No:324764;

TRL (Technology Readiness Level)

TRL-4, Proof of concept tested in Lab;

Research Lab

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<https://ipm.icsr.in/ipm/>

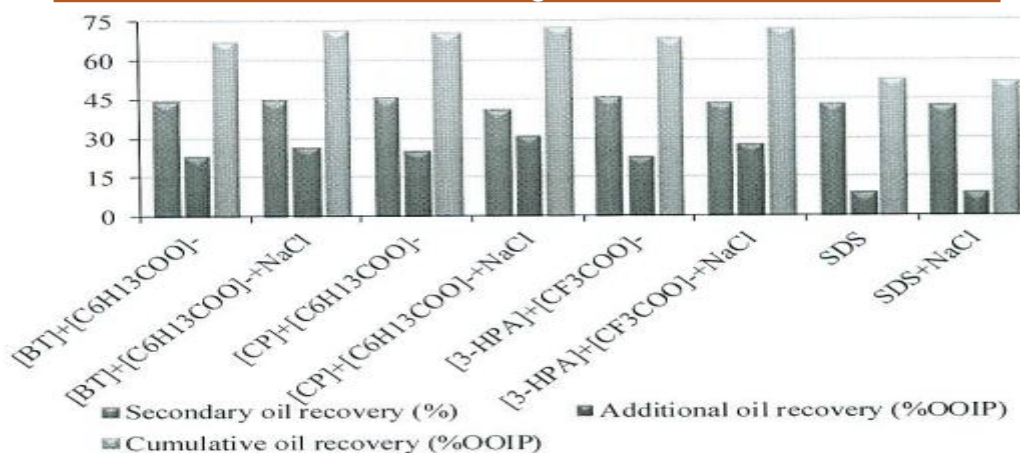
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Key Features / Value Proposition

- Provides a process for **enhanced oil recovery** using lactam and hydroxyl ammonium based ionic liquids by **enabling the reduction of interfacial tension (IFT)** in the formation water reservoir,
- Facilitates **enhanced recovery of residual crude oil** from reservoirs.
- **Small amount of ionic liquids (ILs)** (in ppm) is **very effective in enhancing the oil recovery**.
- Overall recovery is about **70%**, shows **a great improvement in recovery factor**.
- The process is indeed an **economic intensive** for upstream oil & gas industry.

Images



Sample Result

Core No	Slug type	S _o i	S _{or} (%)			I S V (P V)	Seco nda ry oil reco very (%)	Additional oil recovery (%OOIP)			Tot al add itio nal oil reco very (% OO IP)	Cu mul ative oil reco very (% OOI P)	
			Aft er wa ter flo od (% OOI P)	Aft er IL/ SD S flu g flo od (% OOI P)	Aft er pol ym er flo od (% OOI P)			Aft er cha se wa ter flo od (% OOI P)	Aft er IL/ SD S flu g flo od (% OOI P)	Aft er pol ym er flo od (% OOI P)			Aft er cha se wa ter flo od (% OOI P)
1	[BT] ⁺ [C ₆ H ₁₃ COO] ⁻	5 3. 5	55. 83	42. 50	35. 00	32. 50	0. 2 5	44.1 7	13. 33	7.5 0	2.5 0	23.3 3	67.5 0

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