J Biotechnol Biomater 2017, 7:4 (Suppl)
DOI: 10.4172/2155-952X-C1-080

18th Biotechnology Congress

October 19-20, 2017 | New York, USA

Biosurfactant produced by *Serratia spp*. for enhanced oil recovery

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Conventional hydrocarbons recovery from a heavy oil field is less than 40%; therefore, new technologies are needed to improve the recovery factor. Bio-surfactants (BS) are amphiphilic molecules produced by microorganisms, that change the surface tension (ST), the interfacial tension (IT) and also the wettability of a rock. Recently, the interest in the use and applications of BS has increased because they have low toxicity, and capability to work in drastic conditions (high temperature, salinity and pH). The aim of this work was to evaluate the use of a BS, produced by IMP-X strain, as an enhanced oil recovery process in porous media impregnated with heavy oil from a Mexican field. IMP-X strain was isolated from a hydrocarbon-contaminated soil and identified by 16S rRNA as Serratia sp (GenBank number HQ686060). This microorganism was able to produce BS using waste cooking oil. BS reduces ST up to 28.3 mN/m, IT with heavy oil up to 2.75 mN/m, and has critical micelle concentration of 750 ppm. BS in the porous media changes the wettability from preferential oil-wet to preferential water-wet (contact angle of the system with BS 57.6°), within these changes, mobilization of the oil increase. A first oil recovery experiment was carried out in a sand packed column using Ottawa rock impregnated with heavy oil of 15.3 °API (viscosity 258 cP @ 60°C) at 60°C. Water and BS were used for injections. The results show that an additional 16.5 % of oil recovery was achieved with respect to the water injection. A second oil recovery experiment was done using oil of 15°API (viscosity 146 cP @ 70°C) and in a Bedford-limestone core at reservoir conditions (70°C and 1,706 psig). Water and BS were used for sequential injections. The results showed an additional 10.1% of oil recovery achieved with BS.

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