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## Green surfactants for enhanced oil recovery: A review

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## ABSTRACT

EOR or Enhanced Oil Recovery has been demonstrated to be an efficient oil recovery technology for recovering bypassed oil and residual oil that has become stranded in the reservoir. The goal of implementing EOR is to extend reservoir life beyond previous economic constraints by assisting in the use of water floods or other traditional methods of extending reservoir life. The flooding method has been shown to be the most effective among all improved oil recovery approaches, and it is known as the surfactant flooding method due to its ability to minimize interfacial tension and improve mobility control. It has been shown to be one of the most efficient tertiary recovery strategies for achieving high displacement efficiency. The tertiary approach's performance is heavily dependent on a number of critical components, including surfactant content, pH, and salinity. Academics are currently interested in Green Enhanced Oil Recovery (GEOR), or green enhanced oil recovery, because it will help drive down costs while also being more environmentally friendly. Researchers have shown that developing a green-based surfactant for surfactant flooding is feasible and, in some cases, more efficient. As a result, the latest research on green surfactants from various resources used for surfactant flooding for enhanced oil recovery was presented in this review paper.

### 1. Introduction

Surfactants can be selected following reservoir characteristics and rock kind. Surfactant screening techniques are typically used for surfactant selection, which impose restrictions relating to the interfacial tension (IFT) and surfactant adsorption [1]. Currently, a new alternative of commercial surfactant has been considered for surfactant flooding. Green surfactants, also known as biosurfactants, are amphiphilic biological molecules created by microorganisms such as bacteria, yeasts, and fungus from a variety of sources, including waste material [2]. The success of the tertiary method is strongly based on several key components such as the concentration of the surfactant, pH and also the temperature. In general, these chemical surfactants are made synthetically with the most commonly used surfactant include anionic surfactant called sodium dodecyl sulphate (SDS), alkylene-oxide, alkyl-ethylene oxide and many more. Surfactants can be categorized into four different types of surfactants that are zwitterionic surfactants, cationic, anionic, and non-ionic nevertheless, the major idea of surfactants are to lower the IFT which all of these surfactants are able to do [3]. (See Fig. 1, Fig. 2.)

There is currently a scarcity of study on different pH of green surfactant. There are known studies on the development of green surfactants, however, most of them are in different climate regions like China,

Russia, and United States. Surfactants are typically the most expensive component of an EOR process, and the loss of surfactant during oil production results in significant financial losses. The capability is highly dependent on surfactant concentration for oil recovery [4].

### 2. Green surfactant Source, composition and formation

Enhanced Oil Recovery (EOR) methods are like a set of tricks that help get more oil out of the ground efficiently. This is done by adding things like chemicals, gases, or specially treated water into the underground oil reserves. It's also about changing the properties of the oil itself. The main aim is to get more oil after the first and second attempts at pumping it out. To do this, EOR uses different methods. Some involve heating the oil, others use special chemicals, and there's even a technique where gases are mixed in. All these methods work together to make sure more oil is taken out faster, and they also help separate oil from water in the process [5]. There are two ways we use surfactants to make oil recovery better: surfactant flooding and surfactant stimulation. Surfactants mainly help by reducing the stickiness between oil and rocks, making it easier for oil to move around. They also have the job of changing how easily oil can flow through the rocks [6].

Green Enhanced Oil Recovery (GEOR) is a type of technology that

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