BIOPOLYMERS FOR CHEMICAL
ENHANCED OIL RECOVERY

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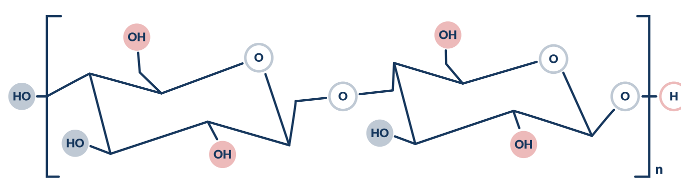
In order to improve volumetric sweeping efficiency in medium and light oil reservoirs, polymer flooding has been implemented on a pilot and commercial scale. Polymeric solutions allow the viscosity of the injection water to be increased and the mobility ratio to be improved, exerting a better displacement and thrust in the porous medium. Taking into account reservoir conditions and flow conditions, the polymers used for enhanced recovery must have good thermal, chemical, and mechanical stability. In general, polyacrylamides have been normally applied in enhanced recovery projects. However, their properties make them weak in the harsh environments of the reservoir and water. In this way, the improvement of the normally used polyacrylamides and the development of new polymers with these characteristics constitute potential focuses of research and study.

From another perspective, the treatment of residual biomass has also become a focus of study. Converting waste into materials with higher value is an ideal pursued by current circular economy models. Furthering the two objectives mentioned shortly is the production and use of biopolymers. Natural polymers are a class of polymers that refer to polymers that come from nature, be it plants or animals. These primarily include existing carbohydrates and proteins that provide structural support. These are derived from extraction from their bulk form in nature, for example, gums or lignin extracted from wood, and from polymers produced by processes such as bacterial synthesis or fermentation.

Biopolymers are mostly obtained through fermentation processes. Different investigations have used residual biomass such as the peel of some fruits rich in cellulosic components. The state of the art reports the application in experimental studies of the following biopolymers:

- Xanthan gum
- Scleroglucan
- Cellulose
- Lignin
- Welan gum
- Guar gum
- Mushroom polysaccharides

Chemical structure of cellulose



In 2014, a pilot test was carried out at the Bockstedt field in northern Germany. The test involved the injection of a biopolymer in a pattern of three producing wells and one injection well. More than 45,000 m3 (283,000 barrels) of biopolymer solution were injected. As a result, the oil production rate increased by more than 20% compared to water injection. This pilot test confirmed adequate injectivity and early results in better oil production.