

## Adding value to galactomannan polysaccharides with copper enzymes

“By working with industrialists to address a specific question, we have gained unique insights from those with first-hand experience of running a commercial process.” Julea Butt



**Schlumberger**

Julea Butt, University of East Anglia

Seth Hartshorne, Schlumberger Gould Research



Guar beans, from which guar gum is made

**OUTCOMES:** Guar gum is a galactomannan that is comprised of covalently linked sugar molecules, namely mannose and galactose. In this project, polymer hydrolysis resulting in chain shortening was demonstrated using a commercially available enzyme, cellulase. Oxidation of the galactose sidechains within the polymer in aqueous solution was shown using another commercially available enzyme, galactose oxidase. In addition, electrochemical oxidation of the galactose and mannose sugars was demonstrated by oxidation of aqueous guar suspensions at a graphite electrode. The results demonstrate that commercially available enzymes offer routes to controlled modification of guar in aqueous solution and this offers prospects for the development of more sustainable routes to industrial-scale galactomannan modification.

**INITIAL AIMS:** Concerns over fuel security are frequent headline news and the rising costs of fuel are a daily reminder of the challenges faced by a global society with ever-increasing energy demands. Medium- to long-term solutions to these challenges will require effective access to renewable energy alongside the development of infrastructures that enable such energy to be delivered to the point of need with the same ease as fossil fuels. Improved technologies to increase the recovery of natural gas presents an attractive option for the short to medium term. Here we aim to investigate opportunities to develop improved stimulation technologies through the use of copper-containing enzymes that can modify the rheological properties of a natural biopolymer guar.

- Commercially available enzymes might provide a more sustainable route to industrial-scale guar gum modification
- Modified polysaccharides such as guar could improve hydrocarbon recovery technologies