Compositions and methods and uses relating thereto

The present invention relates to compositions suitable for use as additives for crude oil, and to methods and uses relating thereto. In particular the invention relates to the use of additive compositions which modify the viscosity of crude oil.

Crude oil must be transported through pipelines before being converted into useful products. However its high viscosity means that the transport of crude oil through pipelines is difficult, especially in the case of heavy crude oil.

Pumps are typically used to drive crude oil through pipelines. These pumps operate at high pressures and pipelines may be heated. Thus this is an energy intensive process.

Reducing the viscosity of the crude oil at a particular temperature will allow it to be pumped at a lower pressure. Alternatively a greater flow rate can be achieved at the same pressure. This may offer cost savings and environmental benefits.

Many ways of modifying the viscosity of crude oil are known in the art. Various compounds have been added to modify the viscosity including polymer blends (US4010006), organic fluorocarbons (US4876018), amine-chelate complexes (US6402934), alkyl-substituted phenol formaldehyde resins (US8575082) and random acrylate based copolymers and terpolymers (US9120885).

US5863301 describes the formation of an emulsion with water to improve the flow characteristics of crude oil. These emulsions comprise 60 to 85% oil and 15 to 40% water and a combination of emulsifiers is used. One suitable anionic emulsifier is dioctyl sulfosuccinate. The compositions typically comprise 25% or more of water.

Dioctyl sulfosuccinate has also been added to crude oil as a demulsifier during the desalting process (US4200550) and as an anti-fouling agent (US4222853).

SUMMARY

In one aspect, there is provided a method of reducing the viscosity of a crude oil, the method comprising adding to the crude oil (i) a surfactant compound including at least two hydrophobic groups wherein the resultant mixture has a water content of less than 10 vol%.

In another aspect, there is peovided a crude oil composition comprising (i) a sulfosuccinate ester; (ii) oxyalkylated phenolic resins; (iii) polyoxyalkylene ethers; (iv) aryl sulfonic acid

compounds; (v) alkoxylated amines; (vi) polyol esters; (vii) polysulfones; and (viii) conductivity improvers; wherein the composition has a water content of less than 10 vol%.

In yet another aspect, there is provided an additive composition comprising (i) a surfactant compound including at least two hydrophobic groups; and optionally one or more further components selected from: (ii) oxyalkylated phenolic resins; (iii) polyoxyalkylene ethers; (iv) aryl sulfonic acid compounds; (v) alkoxylated amines; (vi) polyol esters; (vii) polysulfones; and (viii) conductivity improvers.

In a further aspect, there is provided a use of a surfactant compound including at least two hydrophobic groups to reduce the viscosity of a crude oil composition.

DETAILED DESCRIPTION

The present invention seeks to provide an alternative means for reducing the viscosity of crude oil, especially heavy crude oil and in particular heavy crude oil having a low water content.

According to a first aspect of the present invention there is provided a method of reducing the viscosity of a crude oil, the method comprising adding to the crude oil (i) a surfactant compound including at least two hydrophobic groups, wherein the resultant mixture has a water content of less than 10 vol%.