CLAIMS

1. An oil-based drilling fluid comprising:

a base oil continuous phase, wherein the base oil continuous phase comprises a base oil;

an aqueous dispersed phase; and

at least one rheology modifier comprising a modified magnesium/aluminum carbonate layered-double hydroxide (Mg/Al-CO_3 LDH) compound.

2. The oil-based drilling fluid of claim 1, in which the magnesium/aluminum carbonate layered-double hydroxide (Mg/Al-CO_3 LDH) compound is prepared by:

mixing a magnesium compound, an aluminum compound, and an aqueous solution to form an initial solution;

adding at least one basic compound to the initial solution to form a reaction solution, the at least one basic compound comprising a carbonate salt or a bicarbonate salt;

optionally adjusting the pH with a solution comprising; and

heating the reaction solution at a reaction temperature for a reaction time to form the Mg/Al-CO_3 LDH compound.

3. The oil-based drilling fluid of any of claims 1 or 2, in which the base oil is chosen from a base oil chosen from a synthetic oil comprising an ester or olefin, a diesel oil, or a mineral oil, in which the synthetic oil, the diesel oil, or the mineral oil comprises hydrocarbons chosen from n-paraffins, iso-paraffins, cyclic alkanes, branched alkanes, or mixtures thereof.

4. The oil-based drilling fluid of any of claims 1 or 2, further comprising at least one additive chosen from emulsifiers, wetting agents, alkalinity control agents, fluid-loss control agents, suspending agents, weight-adjusting agents, density-adjusting agents, or combinations thereof.

5. The oil-based drilling fluid of any of claims 1 or 2, comprising from 0.1 wt.% to 1.0 wt.% rheology modifier, based on the total weight of the oil-based drilling fluid.

6. The oil-based drilling fluid of any of claims 1 or 2, in which the aqueous dispersed phase contains a brine chosen from calcium chloride, calcium bromide, sodium chloride, sodium bromide, and combinations thereof.

7. The oil-based drilling fluid of any of claims 1 or 2, in which:

the oil-based drilling fluid exhibits physical characteristics suitable for use of the oil-based drilling fluid under high-pressure high-temperature conditions during drilling operations; and

the high-pressure high-temperature conditions during drilling operations comprise a wellbore pressure greater than 10,000 psi and a wellbore temperature greater than 300 °F.

8. A method for preparing an oil-based drilling fluid, the method comprising:

mixing a base oil, at least one emulsifier, and at least one wetting agent to form a base oil continuous phase; and

adding at least one rheology modifier into the base oil continuous phase to form a oil-based drilling fluid, in which the at least one rheology modifier comprises a modified magnesium/aluminum carbonate layered-double hydroxide compound.

9. The method of claim 8, in which the oil-based drilling fluid further comprises at least one additive chosen from a fluid-loss control additive, a brine solution, at least one weighting additive, a rheology modifier, and combinations thereof.

10. The method of claim 8, in which the modified magnesium/aluminum carbonate (Mg/Al-CO_3) compound is prepared by:

mixing a magnesium compound, an aluminum compound, and an aqueous solution to form an initial solution;

adding at least one basic compound to the initial solution to form a reaction solution, the at least one basic compound comprising a carbonate salt or a bicarbonate salt;

optionally adjusting the pH with a solution comprising; and

heating the reaction solution at a reaction temperature for a reaction time to form the Mg/Al-CO_3 LDH compound.

11. The method of any of claims 8 to 10, in which the base oil continuous phase comprises a base oil chosen from a synthetic oil comprising an ester or olefin, a diesel oil, or a mineral oil, in which the synthetic oil, the diesel oil, or the mineral oil comprises hydrocarbons chosen from n-paraffins, iso-paraffins, cyclic alkanes, branched alkanes, or mixtures thereof.

12. The method of any of claims 8 to 10, in which the brine solution is chosen from calcium chloride, calcium bromide, sodium chloride, sodium bromide, and combinations thereof.

13. A method for drilling in a subterranean formation under high-pressure high-temperature conditions, the method comprising:

providing or using in the drilling of a wellbore into the subterranean formation an oil-based drilling fluid according to any of claims 1 or 2, in which high-pressure high-temperature conditions comprise a wellbore pressure greater than 10,000 psi and a wellbore temperature greater than 300 °F.

14. A method of drilling a subterranean well, the method comprising:

operating a drill in a wellbore in the presence of an oil-based drilling fluid comprising:

a base oil;

at least one additive chosen from an emulsifier, a weighting material, a fluid-loss additive, a viscosifiers, or an alkali compound; and

from 0.1 wt.% to 1 wt.%, based on the total weight of the drilling fluid, of a magnesium/aluminum carbonate layered double hydroxide compound.

15. The method of claim 14, further comprising adding the magnesium/aluminum carbonate layered double hydroxide compound to the drilling fluid before or during operating the drill in the wellbore.