CLAIMS

1. A method for modifying bentonite to allow the bentonite to be useful in drilling mud applications, the method characterized by the steps of:

preparing a sodium-type bentonite local to the Khulais area of Saudi Arabia using raw water to remove contaminants from the bentonite;

grinding the bentonite to a fine powder;

sieving the fine powder to be between 50 μm and 150 μm in particle size to produce a sieved fine powder;

mixing the sieved fine powder with solid powder polyanionic cellulose polymer to produce a physically treated modified bentonite composition, the modified bentonite composition comprising between about 3% and about 11% polyanionic cellulose polymer by weight;

adding the modified bentonite composition to water until a homogeneous solution of modified bentonite in water is formed; and

allowing the homogeneous solution of modified bentonite in water to sit at rest at room temperature to form a composition useful in drilling mud applications, wherein a ratio of yield point to plastic viscosity is about at least 0.7 and sufficient for cuttings transport and suspension in the drilling mud applications.

2. The method according to claim 1, wherein the homogeneous solution of modified bentonite in water is formed in 20 minutes.

3. The method according to claim 1 or 2, wherein no hydroxide compositions are used in the method for modifying bentonite.

4. The method according to any one of claims 1-3, wherein the bentonite local to Saudi Arabia is characterized by weight percent 58% sodium montmorillonite, 5 % feldspar, 25% SiO_2, 8% kaolinite, 2% halite, and 2% illite.

5. The method according to any one of claims 1-4, wherein the modified bentonite composition is characterized by weight percent 71% sodium montmorillonite, 5 % feldspar, 15% SiO_2, 6% kaolinite, 0% halite, and 1% illite.

6. The method according to any one of claims 1-5, further characterized by the step of mixing the sieved fine powder with a low viscosity sodium carboxymethyl cellulose in addition to the polyanionic cellulose polymer.

7. The method according to any one of claims 1-3, wherein the modified bentonite composition is characterized by between 4% and 10% polyanionic cellulose polymer by weight.

8. The method according to any one of claims 1-3, wherein the modified bentonite composition is characterized by between 4% and 9% polyanionic cellulose polymer by weight.

9. The method according to any one of claims 1-3, wherein the modified bentonite composition is characterized by between 5% and 8% polyanionic cellulose polymer by weight.

10. The method according to any one of claims 1-3, wherein the modified bentonite composition is characterized by 8.5% polyanionic cellulose polymer by weight.

11. The method according to any one of claims 1-3, wherein the polyanionic cellulose polymer is characterized by at least a first polyanionic cellulose polymer and a second polyanionic cellulose polymer.

12. The method according to any one of claims 1-11, further characterized by the step of conducting x-ray powder diffraction (XRD) to compare the composition useful in drilling mud applications to the API Bentonite Weight % values in Table 2.

13. The method according to any one of claims 1-12, further characterized by the step of applying the composition useful in drilling mud applications to a wellbore hydrocarbon recovery operation.

14. The method according to claim 1, wherein the step of allowing the homogeneous solution of modified bentonite in water to sit at rest to form a composition useful in drilling mud applications continues for 16 hours.

15. A modified bentonite composition useful in drilling mud applications, the composition characterized by:

a powdery mixture composition, physically treated at room temperature, characterized by:

90% by weight sodium-type bentonite local to the Khulais area of Saudi Arabia, the bentonite existing as a fine powder, the fine powder to be between 50 μm and 150 μm in particle size, and 10% by weight solid powder polyanionic cellulose polymer; and

water.

16. The composition according to claim 15, wherein the powdery mixture composition is characterized by weight percent 71% sodium montmorillonite, 5 % feldspar, 15% SiO_2, 6% kaolinite, 0% halite, and 1% illite.

17. The composition according to claim 15 or 16, further characterized by soda ash.