CLAIMS

1. A process for modifying a layered double hydroxide (LDH), the process comprising,

   a. providing a water-wet layered double hydroxide of formula:

   $$[M^{z+}_{1-x}M'^{y+}_{x}(OH)_2]^{a+}(X^{n-})_{a/r}\bullet bH_2O \qquad (1)$$

   wherein M and M' are metal cations, z = 1 or 2; y = 3 or 4, x is 0.1 to 1, preferably x<1, more preferably x = 0.1 - 0.9, *b* is 0 to 10, X is an anion, r is 1 to 3, n is the charge on the anion X and a is determined by x, y and z, preferably a = z(1-x)+xy-2;

   b. maintaining the layered double hydroxide water-wet, wherein the water-wet layered double hydroxide is in the form of water slurry; and

   c. contacting the water-wet layered double hydroxide with at least one solvent, the solvent being miscible with water and preferably having a solvent polarity (P') in the range 3.8 to 9.

2. The process as claimed in claim 1, wherein contacting the water-wet layered double hydroxide with the solvent comprises dispersing the layered double hydroxide in the at least one solvent.

3. The process as claimed in claim 1 or 2, wherein M is Mg, Zn, Fe, Ca or a mixture of two or more thereof.

4. The process as claimed in any one of the preceding claims, wherein M' is Al, Ga, Fe or a mixture of Al and Fe.

5. The process as claimed in any one of the preceding claims, wherein z is 2 and M is Ca, Mg, or Zn.

6. The process as claimed in any one of the preceding claims wherein M' is Al.

7. The process as claimed in any one of the preceding claims, wherein M is Zn, Mg or Ca, and M' is Al.

8. The process as claimed in any one of the preceding claims, wherein X is selected from halide, inorganic oxyanions, anionic surfactants, anionic chromophores, and/or anionic UV absorbers.

9. The process as claimed in claim 8, wherein inorganic oxyanion is carbonate, bicarbonate, hydrogenphosphate, dihydrogenphosphate, nitrite, borate, nitrate, sulphate or phosphate or a mixture of two or more thereof.

10. The process as claimed in any one of the preceding claims, wherein the at least one solvent is an organic solvent, preferably anhydrous, and preferably selected from acetone, acetonitrile, dimethylformamide, dimethyl sulfoxide, dioxane, ethanol, methanol, n-propanol, 2-propanol, tetrahydrofuran or a mixture of two or more thereof.

11. The process as claimed in any one of the preceding claims, further comprising a step of drying the LDH obtained in step c.

12. The process as claimed in any one of the preceding claims, further comprising subjecting the layered double hydroxide to a thermal treatment, preferably calcination.

13. A layered double hydroxide, prepared according to the process of any of the preceding claims, wherein the layered double hydroxide has a BET pore volume (N_2) in a range of 0.5 cm^3/g to 3.5 cm^3/g.

14. The layered double hydroxide as claimed in claim 13 having a specific surface area (N_2) of greater than 155 m^2/g, preferably 155 m^2/g - 850 m^2/g, preferably 170 m^2/g - 700 m^2/g, more preferably 250 m^2/g - 650 m^2/g and/or a de-aggregation factor greater than 2, and/or an apparent density of 0.8 g/cm^3 or lower.

~~15. The layered double hydroxide as claimed in claim 13 or 14, wherein the layered double hydroxide has a BET pore volume (N_2) greater than 0.1 cm^3/g.~~

156. The layered double hydroxide as claimed in any one of claims 13 - 154, which has been subjected to a thermal treatment, preferably calcination.

CLAIMS

1. A process for modifying a layered double hydroxide (LDH), the process comprising,

   a. providing a water-wet layered double hydroxide of formula:

   $$[M^{z+}_{1-x}M'^{y+}_{x}(OH)_2]^{a+}(X^{n-})_{a/r}\bullet bH_2O \qquad (1)$$

   wherein M and M' are metal cations, z = 1 or 2; y = 3 or 4, x is 0.1 to 1, preferably x<1, more preferably x = 0.1 - 0.9, *b* is 0 to 10, X is an anion, r is 1 to 3, n is the charge on the anion X and a is determined by x, y and z, preferably a = z(1-x)+xy-2;

   b. maintaining the layered double hydroxide water-wet, wherein the water-wet layered double hydroxide is in the form of water slurry; and

   c. contacting the water-wet layered double hydroxide with at least one solvent, the solvent being miscible with water and preferably having a solvent polarity (P') in the range 3.8 to 9.

2. The process as claimed in claim 1, wherein contacting the water-wet layered double hydroxide with the solvent comprises dispersing the layered double hydroxide in the at least one solvent.

3. The process as claimed in claim 1 or 2, wherein M is Mg, Zn, Fe, Ca or a mixture of two or more thereof.

4. The process as claimed in any one of the preceding claims, wherein M' is Al, Ga, Fe or a mixture of Al and Fe.

5. The process as claimed in any one of the preceding claims, wherein z is 2 and M is Ca, Mg, or Zn.

6. The process as claimed in any one of the preceding claims wherein M' is Al.

7. The process as claimed in any one of the preceding claims, wherein M is Zn, Mg or Ca, and M' is Al.

8. The process as claimed in any one of the preceding claims, wherein X is selected from halide, inorganic oxyanions, anionic surfactants, anionic chromophores, and/or anionic UV absorbers.

9. The process as claimed in claim 8, wherein inorganic oxyanion is carbonate, bicarbonate, hydrogenphosphate, dihydrogenphosphate, nitrite, borate, nitrate, sulphate or phosphate or a mixture of two or more thereof.

10. The process as claimed in any one of the preceding claims, wherein the at least one solvent is an organic solvent, preferably anhydrous, and preferably selected from acetone, acetonitrile, dimethylformamide, dimethyl sulfoxide, dioxane, ethanol, methanol, n-propanol, 2-propanol, tetrahydrofuran or a mixture of two or more thereof.

11. The process as claimed in any one of the preceding claims, further comprising a step of drying the LDH obtained in step c.

12. The process as claimed in any one of the preceding claims, further comprising subjecting the layered double hydroxide to a thermal treatment, preferably calcination.

13. A layered double hydroxide, prepared according to the process of any of the preceding claims, wherein the layered double hydroxide has a BET pore volume (N_2) in a range of 0.5 cm^3/g to 3.5 cm^3/g.

14. The layered double hydroxide as claimed in claim 13 having a specific surface area (N_2) of greater than 155 m^2/g, preferably 155 m^2/g - 850 m^2/g, preferably 170 m^2/g - 700 m^2/g, more preferably 250 m^2/g - 650 m^2/g and/or a de-aggregation factor greater than 2, and/or an apparent density of 0.8 g/cm^3 or lower.

15. The layered double hydroxide as claimed in any one of claims 13 - 14, which has been subjected to a thermal treatment, preferably calcination.