What is claimed is:

1. A process for the preparation of an aqueous dispersion of hydroplasticisable multiphase vinyl polymer particles comprising,

(1) a first polymerization step comprising

(1a) preparing an emulsion (1A) in water of a first monomer mixture (1a1), a surfactant (1a2) and water soluble inorganic salt (1a3),

wherein the first monomers mixture (1a1) comprises

1) carboxylic acid functional monomers,

2) optional crosslinking monomers other than 1

3) vinyl monomers other than 1) and 2) and

4) optional chain transfer agents,

wherein surfactant (1a2) is a sulfur based anionic surfactant containing less than ~~60~~ 50 wt% ethylene oxide and

wherein the water soluble inorganic salt (1a3) content at the start of polymerization (1b) is between 0.01 and 3 gr/kg water,

~~wherein the amount of acid functional monomers introduced in the first monomer mixture (1a1) is such that the acid value of the resulting first polymer is at least 45 mg KOH/g and~~

(1b) emulsion polymerizing the obtained emulsion 1A forming a hydroplasticisable first stage polymer particle dispersion (1B) said first stage polymer having a Tg calculated from the Fox equation from 10 to 125°C,

wherein the first particle dispersion (1B) has a particle size below 50 nm (Z average mean as measured by dynamic light scattering).

-(2) a second polymerization step comprising

(2a) adding to dispersion 1B a second monomer mixture (2a1) comprising

1) monomers chosen from the same group as in the first monomer mixture (1a1)

2) optional monomers (2a2) comprising 2 or more ethylenically unsaturated groups for pre-crosslinking, preferably in an amount less than 2 wt%,

wherein carboxylic acid functional monomers in the second monomer mixture is present in an amount such that the acid value of the resulting second polymer is less than 23 mg KOH/g and

wherein the amount of monomer mixture (2a1) is between 10 and 90 wt% of the total weight of monomer mixtures (1a1) plus (2a1)

(2b) polymerizing second monomer mixture (2a1) to form a second stage polymer in the first particle dispersion (1B) to form a multiphase particle dispersion (2B)

(3) optionally hydroplasticising the multiphase particle dispersion (2B) by addition of base, preferably a volatile base, to a pH between 6.5 and 10, preferably 9.

(4) optionally adding a separate crosslinking agent for reaction with crosslinking monomers in monomer mixtures (1a1) or (2a1) or with unsaturated groups (2a2)

2. The process according to claim 1, wherein in the polymerization step (2b) the multiphase particles in the multiphase particle dispersion (2B) have an average particle size of less than 80 nm (Z average mean as measured by dynamic light scattering).

3. The process according to claim 1 or 2, wherein the multiphase particle dispersion (2B) has a transparency value of at least 35 at a solids content of at least 35 wt%.

4. The process according to claims 1 to 3, wherein the first monomer mixture (1a1) comprises

1) 1-45 wt% carboxylic acid functional monomers (wt% relative to the total weight of monomers in the first monomer mixture)

2) 0-20 wt% optional crosslinking monomers other than 1,

3) 98.5-50 wt% vinyl monomers other than 1) and 2),

4) optional chain transfer agents.

5. The process according to claims 1 to 4, wherein the amount of surfactant (1a2) is less than 2 wt% relative to the total amount of the first monomer mixture (1a1).

6. The process according to claims 1 to 5, wherein the surfactant (1a2) is chosen from the group of salts of alkylethoxylate sulfates and sulfonates, alkylphenolethoxylate sulfates and sulfonates, alkylsulfates and sulfonates, alkylaryl sulfonates, sulfosuccinates, sulfur-based surfactants containing less than 560 wt% ethylene oxide, sulfur-based surfactants having an ethylenically unsaturated bond that can participate in a free radical polymerization and mixtures thereof.

~~7. The process according to claims 1 to 6, wherein the first particle dispersion (1B) has a particle size below 50 nm (Z average mean as measured by dynamic light scattering).~~

7. The process according to claims 1 to 6~~7~~, wherein before the start of the second polymerisation the pH is adjusted only to such extent that the first polymer is not neutralised and solubilised and the particles remain particles with a measurable particle size~~, preferably the pH at the start of the second polymerisation being below 7~~.

~~8. The process according to claims 1 to 7, wherein before the start of the second polymerisation the pH is adjusted only to such extent that the first polymer is not neutralised and solubilised and the particles remain particles with a measurable particle size, preferably the pH at the start of the second polymerisation being below 7.~~

8. The process according to claim 7, wherein the pH at the start of the second polymerisation is below 7.

9. The process according to claims 1 to 8, further comprising a step (3) comprising hydroplasticising the multiphase particle dispersion (2B) by addition of base, preferably a volatile base, to a pH between 6.5 and 9.

10. The process according to claims 1 to 9, further comprising a step (4) comprising adding a separate crosslinking agent for reaction with crosslinking monomers in the first or second stage polymer or with unsaturated groups from pre-crosslinking monomer (2a2) in the second stage polymer.

11. The process according to claims 1 to 10, further comprising step (5) comprising adding another aqueous polymer, preferably an aqueous polymer dispersion,.

12. A multiphase vinyl polymer particle dispersion obtainable according to the method according to anyone of claims 1 to 11.

13. The multiphase hydroplasticised vinyl polymer particle dispersion according to claim 12, wherein the multiphase particles have an average particle size of less than 80 nm and preferably comprise less than 20wt%, preferably less than 10wt % of particles having a particle size more than 80 nm.

14. The multiphase vinyl polymer particle dispersion according to claims 12 or 13, having a transparency value of at least 35 (dL) at a solids content of at least 35 wt%.

15. The multiphase vinyl polymer particle dispersion according to claims 12 - 14, comprising neutralised hydroplasticized first stage polymer and having a pH between 6.5 and 10

16. The multiphase vinyl polymer particle dispersion according to claims 12 - 14, comprising not-neutralised hydroplasticisable first stage polymer and having a pH between 4 and 7, preferably 6.5.

17. A coating composition comprising the multiphase vinyl polymer particle dispersion according to claim 15 or 16 and one or more further coating additives.

18. A process for preparing ~~the~~ a coating composition comprising providing ~~according to claim 17, wherein the~~ a hydroplasticisable dispersion 2B obtained by a process comprising,

(1) a first polymerization step comprising

(1a) preparing an emulsion (1A) in water of a first monomer mixture (1a1), a surfactant (1a2) and water soluble inorganic salt (1a3),

wherein the first monomers mixture (1a1) comprises

1) carboxylic acid functional monomers,

2) optional crosslinking monomers other than 1

3) vinyl monomers other than 1) and 2) and

4) optional chain transfer agents,

wherein surfactant (1a2) is a sulfur based anionic surfactant containing less than 60 wt% ethylene oxide and

wherein the water soluble inorganic salt (1a3) content at the start of polymerization (1b) is between 0.01 and 3 gr/kg water,

(1b) emulsion polymerizing the obtained emulsion 1A forming a hydroplasticisable first stage polymer particle dispersion (1B) said first stage polymer having a Tg calculated from the Fox equation from 10 to 125°C,

(2) a second polymerization step comprising

(2a) adding to dispersion 1B a second monomer mixture (2a1) comprising

1) monomers chosen from the same group as in the first monomer mixture (1a1)

2) optional monomers (2a2) comprising 2 or more ethylenically unsaturated groups for pre-crosslinking, preferably in an amount less than 2 wt%,

wherein carboxylic acid functional monomers in the second monomer mixture is present in an amount such that the acid value of the resulting second polymer is less than 23 mg KOH/g and

wherein the amount of monomer mixture (2a1) is between 10 and 90 wt% of the total weight of monomer mixtures (1a1) plus (2a1)

(2b) polymerizing second monomer mixture (2a1) to form a second stage polymer in the first particle dispersion (1B) to form a multiphase particle dispersion (2B)

(3) hydroplasticising the multiphase particle dispersion (2B) by addition of base, preferably a volatile base, to a pH between 6.5 and 10, preferably 9,

(4) optionally adding a separate crosslinking agent for reaction with crosslinking monomers in monomer mixtures (1a1) or (2a1) or with unsaturated groups (2a2),

~~18.~~ wherein hydroplasticisable dispersion 2B is formulated to a coating composition by addition of coating additives before or during the hydroplasticising step (3).

19. Use of the multiphase vinyl polymer particle dispersion of claim 16 for the manufacture of a coating composition having a pH between 4 and 8 for coating wood.