

What is claimed is

1. An insulating coating composition, comprising at least
 - a) chemically toughened epoxy resin component, wherein the ratio of chemically toughened segments, which are elastomeric segments and bonded via chemical reaction on the epoxy resin, is in a range of 20 – 49 wt%, based on the total weight of said chemically modified epoxy resin component;
 - b) a curing agent;
 - c) reinforcing fibers; and
 - d) low-density fillers with a density ranging from 0.05 – 0.7 g/cm³, preferably 0.08 – 0.5 g/cm³, more preferably 0.1 – 0.4 g/cm³.
2. The insulating coating composition according to claim 1, wherein the ratio of chemically toughened segments is in a range of 23 – 45 wt%, such as 32 - 42 wt%.
3. The insulating coating composition according to claim 1, wherein said chemically toughened epoxy resin component comprises or consists of at least one selected from polyester modified epoxy resin, poly(meth)acrylic modified epoxy resin, polyurethane modified epoxy resin, polyether modified epoxy resin, styrene polymers modified epoxy resin, polyolefin modified epoxy resin and polyamide modified epoxy resin; preferably polyester modified epoxy resin and/or poly(meth)acrylic modified epoxy resin; more preferably polyester modified epoxy resin.
4. The insulating coating composition according to any one of preceding claims, wherein said chemically toughened epoxy resin component is based on the epoxy resin selected from aromatic epoxy resin, aliphatic and/or cycloaliphatic polyepoxide, preferably the epoxy resin based on bisphenols, in particular bisphenol A, bisphenol F or bisphenol A/F and hydrogenated product thereof.
5. The insulating coating composition according to any one of preceding claims, wherein

the insulating coating composition contains a thermoset polymer matrix as binder and said chemically toughened epoxy resin component constitute at least 60 wt%, preferably more than 75 wt%, more preferably more than 85 wt%, most preferably more than 95 wt% or 100 wt% of the thermoset polymer matrix binder in the composition.

6. The insulating coating composition according to any one of preceding claims, wherein the amount of said curing agent is from 10 to 30 wt% based on the total weight of the composition.

7. The insulating coating composition according to any one of preceding claims, wherein the amount of said reinforcing fibers is in a range of 2.1 – 6 wt%, such as 2.5 – 5 wt% or 3 – 4.5 wt%, based on the total weight of the composition.

8. The insulating coating composition according to any one of preceding claims, wherein the amount of said low-density fillers is in a range of 5 – 60 wt%, preferably 7 – 50 wt%, more preferably 10 – 30 wt%, based on the total weight of the composition.

9. The insulating coating composition according to any one of preceding claims, wherein said low-density fillers contain the combination of hollow glass bubbles and organic polymer microspheres, and preferably consist of hollow glass bubbles and organic polymer microspheres.

10. The insulating coating composition according to any one of preceding claims, wherein said composition contains 5 – 30 wt%, preferably 8 – 21 wt% or 8 – 15 wt% of hollow glass bubbles and 5 – 20 wt%, preferably 7 – 15 wt% or 8 – 12 wt% of organic polymer microspheres, in each case based on the total weight of the composition.

11. The insulating coating composition according to any one of preceding claims, wherein the mass ratio of hollow glass bubbles to organic polymer microspheres is from 0.6 : 1 to 2 : 1,

such as from 1 : 1 to 1.6 : 1.

12. The insulating coating composition according to any one of preceding claims, wherein said organic polymer microsphere are solid and preferably selected from natural or synthesized elastomeric or rubbery polymers, for example acrylonitrile polymers, polystyrenes, poly(meth)acrylates, polyolefins, starches, polylactic acid, natural rubber, styrene-butadiene rubber, carboxylic styrene-butadiene rubber, butadiene-acrylonitrile rubber, carboxylic butadiene-acrylonitrile rubber, polybutadiene rubber, silicon rubber, chloroprene rubber, acrylic rubbers, butadiene-styrene-vinylpyridine rubber, isoprene rubber, butyl rubber, polysulfide rubber, acrylate-butadiene rubber, polyurethane rubber, fluororubber and ethylene-vinylacetate polymer and the mixture thereof; or copolymers or copolymers with core-shell structure formed by the above-mentioned polymers or the monomers forming the above-mentioned polymers, or mixture thereof.

13. The insulating coating composition according to claim 12, wherein said polymer microspheres contain acrylonitrile polymers, polystyrenes, poly(meth)acrylates, polyolefins, polybutadiene rubber, ethylene-vinylacetate polymer, or copolymers with core-shell structure formed by the above-mentioned polymers or the monomers forming the above-mentioned polymers, or mixture thereof; preferably, said polymer microspheres are microspheres having shell of acrylonitrile polymers.

14. The insulating coating composition according to claim 12, wherein said polymer microspheres are covered by inorganic mineral powders which are selected from talc, calcined kaolin, limestone, calcium carbonate, wollastonite and/or fumed silica, preferably calcium carbonate.

15. The insulating coating composition according to any one of preceding claims, wherein said curing agent contains at least one selected from amines, amine adducts, polyamide and polyetheramine, preferably polyamides curing agents.

16. The insulating coating composition according to any one of preceding claims, wherein said reinforcing fibers contain at least one selected from polyester fibers, mineral fibers, ceramic fibers, glass fibers, carbon fibers, and basalt fibers, preferably glass fibers, carbon fibers and/or ceramic fibers.

17. The insulating coating composition according to any one of preceding claims, wherein said composition further contains from 5 to 15 % of plasticizer and/or from 5 to 20% of diluent, based on the total weight of the composition.

18. Substrate, on which the insulating coating composition according to one of claims 1 to 17 is coated.

19. Substrate according to claim 18, wherein said substrate is a metallic substrate, preferable steel, more preferably steel construction.

20. Substrates according to any one of preceding claims, wherein at least one additional coating which composition is different from the insulating coating composition according to any one of preceding claims is coated on the substrate, preferably said additional coating being flame resistant coating.

21. Substrates according to claim 20, characterized in that said flame resistant coating is an intumescent coating containing the components selected from acid source, intumescent agent (foaming agent) and carbon source.

22. A method for protecting a substrate, including the following steps:

(1) providing a substrate optionally coated with a first coating, preferably a flame resistant coating; and

(2) applying an insulating coating composition according to one of claims 1 to 17 on the substrate or the first coating.

23. Method according to claim 22, wherein said substrate is a metallic substrate, preferably steel, more preferably steel construction.

24. Method according to claim 22, characterized in that said flame resistant coating is an intumescent coating containing the components selected from acid source, intumescent agent (foaming agent) and carbon source.