In the claims:

1. A radiation-treated, concrete reinforcement fiber, comprising:

a concrete reinforcement fiber, comprising monofilaments, having a surface, and selected from the group consisting of polymer fiber, aramid fiber and blends or mixtures thereof; and

a modification on the surface formed by exposure to electromagnetic energy and/or electron-beam radiation to form a radiation-modified, concrete reinforcement fiber, the modification selected from the group consisting of deformation, abrasion, roughness, asperity, porosity, and combinations thereof,

wherein the radiation-modified, concrete reinforcement fiber has one or more of a higher modulus, higher tensile strength and greater surface area than the modulus, tensile strength and surface area of a concrete reinforcement fiber without the modification, and

wherein the radiation-modified, concrete reinforcement fiber is incorporated into a mixture or blend of concrete prior to the concrete being set or field placed.

2. The radiation-treated, concrete reinforcement fiber of claim 1, wherein the electromagnetic energy comprises gamma rays.

3. The radiation-treated, concrete reinforcement fiber of claim 1, wherein the concrete reinforcement fiber is selected from the group consisting of aramid fiber, polyolefin fiber and blends and mixtures thereof.

4. The radiation-treated, concrete reinforcement fiber of claim 1, wherein the modification comprises an abraded surface.

5. The radiation-treated, concrete reinforcement fiber of claim 1, wherein the modification comprises a porous surface.

6. The radiation-treated, concrete reinforcement fiber of claim 1, wherein the electromagnetic energy and/or electron-beam radiation constitutes a dose of 5 kGy to less than 35 kGy of radiation.

7. The radiation-treated, concrete reinforcement fiber of claim 1, wherein the electromagnetic energy and/or electron-beam radiation constitutes a dose of 5 kGy of radiation.

8. A method of treating a concrete reinforcement fiber, comprising:

obtaining a concrete reinforcement fiber, comprising monofilaments, having a surface, and selected from the group consisting of polymer fiber, aramid fiber and blends or mixtures thereof;

modifying the surface by exposing the concrete reinforcement fiber to a radiation source selected from electromagnetic energy and electron-beam radiation;

forming a radiation-modified concrete reinforcement fiber having a modification to the surface as compared to reinforcement fiber without a radiation treatment, the modification selected from the group consisting of deformation, abrasion, roughness, asperity, porosity, and combinations thereof, and

incorporating the radiation-modified concrete reinforcement fiber into a mixture or blend of concrete prior to the concrete being set or field placed.

9. A reinforced asphalt or portland cement concrete composition, comprising:

a plurality of radiation-treated concrete reinforcement fibers, comprising:

concrete reinforcement fibers, comprising monofilaments, having a surface, and selected from the group consisting of polymer fiber, aramid fiber and blends or mixtures thereof; and

a modification to the surface formed by exposure to electromagnetic energy and/or electron-beam radiation, the modification selected from the group consisting of deformation, abrasion, roughness, asperity, porosity, and combinations thereof;

aggregate; and

binder,

wherein the plurality of radiation-treated, concrete reinforcement fibers have one or more of a higher modulus, higher tensile strength and greater surface area than the modulus, tensile strength and surface area of concrete reinforcement fibers without the modification.

10. A reinforced grout composition, comprising:

a plurality of radiation-treated reinforcement fibers, comprising:

a surface; and

a modification to the surface formed by exposure to electromagnetic energy and/or electron-beam radiation, the modification selected from the group consisting of deformation, abrasion, roughness, asperity, porosity, and combinations thereof; and

dry grout material or blend,

wherein the plurality of radiation-treated, concrete reinforcement fibers have one or more of a higher modulus, higher tensile strength and greater surface area than the modulus, tensile strength and surface area of concrete reinforcement fibers without the modification.

11. The grout composition of claim 10, wherein the dry grout material or blend is selected from the group consisting of cement, bentonite clay and mixtures thereof.