

fibers at a temperature substantially below the softening point of the glass fibers in accordance with the present invention. The glass fibers 12 are not fused or melted. FIGS. 3A and 3B are photomicrographs illustrating the densified, embrittled glass fibers 14 of the present invention after grinding.

The dental composites of the present invention provide improved handling characteristics, physical properties, and provide an attractive substitute to dental amalgam alloys as direct filling materials. The composites allow use of mechanical packing and condensing with its attendant advantages. The ground, densified, embrittled glass fiber filler of the present invention may further be utilized in numerous other applications in the practice of dentistry, including periodontal splitting, tooth replacement, tooth stabilization, bridge manufacture, and the like. All of these will not be described herein, as such dental operations are well known to those practicing dentistry, i.e. those of ordinary skill in the art.

While preferred embodiments have been shown and described, various modifications and substitutions may be made thereto without departing from the spirit and scope of the invention. Accordingly, it is to be understood that the present invention has been described by way of illustrations and not limitation.

What is claimed is:

1. A method of making a composition for forming a dental composite material, comprising heating glass fibers at a temperature between about 100° C. and 140° C. below the softening point of the glass for a period of time effective to densify and embrittle the glass fibers; cooling the densified, embrittled glass fibers; grinding the densified, embrittled glass fibers to form ground, densified, embrittled glass particles; and incorporating the ground, densified, embrittled glass particles into a polymeric matrix precursor composition to form a dental composite.
2. The method of claim 1, where the glass fibers have a composition comprising about 64–66% SiO₂, 24–25% Al₂O₃, 0–0.1% CaO, 9.5–10% MgO, 0–0.2% Na₂O+K₂O, and 0–0.1% Fe₂O₃.
3. The method of claim 2, wherein the temperature is in the range between about 920° C. and about 950° C.
4. The method of claim 2, wherein the temperature is about 940° C.
5. The method of claim 1, wherein the ground, densified, embrittled glass particles have an average particle size of less than about 80 microns.
6. The method of claim 1, wherein the polymeric matrix precursor composition comprises at least one acrylate or methacrylate monomer.
7. The method of claim 1, wherein the ground, densified, embrittled glass particles comprise from about 5% to about 80% by weight of the total composition.
8. The method of claim 7, wherein the ground, densified, embrittled glass particles comprise about 35% by weight of the total composition.
9. The method of claim 1, wherein the composition comprises at least one additional filler material.
10. The method of claim 9, wherein the filler material is at least one of silica, silicate glass, quartz, barium silicate, strontium silicate, barium

borosilicate, borosilicate, lithium silicate, amorphous silica, ammoniated or deammoniated calcium phosphate, alumina, zirconia, tin oxide or titania.

11. The method of claim 10, wherein the at least one additional filler material is barium borosilicate, comprising between about 5% to about 85% by weight of the total composition.
12. A dental composite composition for forming a dental restoration comprising ground, densified, embrittled glass particles, wherein the particles are derived from glass fibers heated at a temperature between about 100° C. and 140° C. below the softening point of the glass fibers for a period of time effective to densify and embrittle the glass fibers, the densified, embrittled glass fibers being subsequently ground; and a polymeric matrix precursor composition.
13. The composite of claim 12, wherein the glass fibers have a composition comprising about 64–66% SiO₂, 24–25% Al₂O₃, 0–0.1% CaO, 9.5–10% MgO, 0–0.2% Na₂O+K₂O, and 0–0.1% Fe₂O₃.
14. The composite of claim 13, wherein the temperature is in the range between about 920° and about 950° C.
15. The composite of claim 14, wherein the temperature is about 940° C.
16. The composite of claim 12, wherein the ground, densified, embrittled glass particles have an average particle size of less than about 80 microns.
17. The composite of claim 13, wherein the polymeric matrix precursor composition comprises at least one acrylate or methacrylate monomer.
18. The composite of claim 12, wherein the ground, densified, embrittled glass particles comprise from about 5% to about 80% by weight of the total composite composition.
19. The composite of claim 18, wherein the ground, densified, embrittled glass particles comprise about 35% by weight of the total composite composition.
20. The composite of claim 12, wherein the dental composite comprises at least one additional filler material.
21. The composite of claim 18, wherein the at least one additional filler material is at least one of silica, silicate glass, quartz, barium silicate, strontium silicate, barium borosilicate, borosilicate, lithium silicate, amorphous silica, ammoniated or deammoniated calcium phosphate, alumina, zirconia, tin oxide or titania.
22. The composite of claim 21, wherein the at least one additional filler material is barium borosilicate, comprising between about 5% to about 85% by weight of the total composite composition.
23. A dental restoration comprising ground, densified, embrittled glass particles, wherein the particles are derived from glass fibers heated at a temperature about 100° C. and 140° C. below the softening point of the glass fibers for a period of time effective to densify and embrittle the glass fibers, the densified, embrittled glass fibers being subsequently ground; and a cured polymeric matrix precursor composition.