

X-ray exposure was made within 1 h after the removal of the slurry from the solution. Analysis of the pattern obtained at this stage shows that Cu and Sn are the main components with some additional Cu_3Sn and $\text{Cu}_{5,6}\text{Sn}$ (B'-phase) present. After aging for 69 H at 150°C ., the sample consists of mixture of Cu and Cu_3Sn and traces of another phase.

While the invention has been illustratively described herein with reference to various preferred features, aspects and embodiments, it will be appreciated that the invention is not thus limited, and may be widely varied in respect of alternative variations, modifications, and other embodiments, and therefore the invention is to be broadly construed as including such alternative variations, modifications and other embodiments, within the spirit and scope of the invention claimed.

What is claimed is:

1. A process for consolidating or cold-welding powders, particulates, foils or sheets of metal coated composites, elemental metallic, metallic alloy or intermetallic compounds into net shapes at or near ambient temperature comprising:

removing oxide or adsorbed gases from the surface of the metal coated composites, elemental metallic, metallic alloy or intermetallic compounds thereby forming surface oxide or surface gas free elemental metallic, metallic alloy or intermetallic compounds;

surrounding the surface of the powders, particulates, foils or sheets of the metal coated composite, elemental metallic, metallic alloy or intermetallic compound with an environment of a noble or more noble metal,

treating the surrounded surface oxide or surface gas free metal coated composites, elemental metallic, metallic alloy or intermetallic compounds with an oxide removing agent; and

consolidating the treated metal coated composites, elemental metallic, metallic alloy or intermetallic compounds into a net shape at or near ambient temperature.

2. The process according to claim 1, wherein the surrounding is done by coating the surface of the powders, particulates, foils or sheets.

3. The process according to claim 1 wherein the powders have dimensions of from about $0.1\ \mu\text{m}$ to about $100\ \mu\text{m}$, the sheets have a thickness up to about $500\ \mu\text{m}$ and the foils have a thickness of from about $1\ \mu\text{m}$ to about $1000\ \mu\text{m}$ thick.

4. The process according to claim 1, wherein the elemental metallic, metallic alloy or intermetallic compound is selected from the group consisting of elemental Ag, Au, In, Sn, Ti, Cu, Al, Mn, Fe, alloys or intermetallics thereof.

5. The process according to claim 1, wherein the oxide removing agent is an acid selected from the group consisting of fluoroboric acid, sulfuric acid, hydrofluoric acid, hydrochloric acid, citric acid, adipic acid, ascorbic acid, sodium asorbate, potassium asorbate, sulfamic acid with or without ammonium bifluoride and nitric acid.

6. The process according to claim 5, wherein the acid is dilute acid and is in a concentration of from about 1% to about 30%.

7. The process according to claim 5, wherein the acid is fluoroboric acid and is in a concentration of from about 2% to about 10% by volume.

8. The process according to claim 1, wherein the surface oxide or surface gas is removed by anodically or cathodically treating the metal coated composite, elemental metallic, metallic alloy or intermetallic compounds in a dilute acid.

9. The process according to claim 8, wherein the dilute acid is selected from the group consisting of acetic, fluo-

roboric acid, sulfuric acid, fluoric acid, citric acid, adipic acid, ascorbic acid and nitric acid.

10. The process according to claim 1, wherein the surface oxide or surface gas is removed by immersing the metal coated composite, elemental metallic, metallic alloy, or intermetallic compound in an electrolytic solution of an oxide replacing metal.

11. The process according to claim 10, wherein the oxide replacing metal is selected from the group consisting of Au, Ag, Fe, Pt, Pd, Ni, Co and Cu.

12. The process according to claim 11, wherein the electrolytic solution is selected from the group consisting of sulfamate, iodide, cyanide, nitrate, pyrophosphate, fluoroborate or sulfide salt of the oxide-replacing metal.

13. The process according to claim 12, wherein the electrolytic solution is the fluoroborate of the oxide-replacing metal.

14. The process according to claim 1, wherein the metal coated composite compound is selected from the group consisting of copper coated graphite, copper coated diamond, copper coated tungsten, nickel coated titanium, copper coated aluminum, tin coated nickel, and tin and nickel coated titanium.

15. The process according to claim 14, wherein the oxide removing agent is from about 1 to about 30% fluoroboric acid and the metal coated composite compound is copper coated tungsten.

16. The process according to claim 14, wherein the metal coated composite is consolidated in a hardened steel mold at a pressure of from about 828 to about 1380 MPa.

17. The process according to claim 14, wherein particle size distribution of the diamond, tungsten or graphite is bimodal or trimodal, thereby allowing small sized metal coated composite particles to fill spaces between larger metal coated composite particles.

18. The process according to claim 1, wherein the consolidating takes place in a forging or coining press.

19. The process according to claim 1, wherein the consolidating is done by roll bonding foils or sheets.

20. The process according to claim 1, wherein an elemental metallic is consolidated and removal of the surface oxide is followed by rinsing the elemental metallic in dilute acid of from about 1 to about 5% concentration.

21. The process according to claim 1, wherein a fast diffusion couple is consolidated in situ in a dental cavity while being treated with the oxide removing agent.

22. The process according to claim 21, wherein the fast diffusion couple is silver and tin.

23. The process according to claim 1, wherein the elemental metallic, metallic alloy or intermetallic compound is in the form of a foil; is consolidated after removing surface oxides or adsorbed gases cathodically in a dilute acid; and welded together to fill a dental cavity in situ in the mouth of a patient.

24. The process according to claim 1, wherein the elemental metallic is gold and adsorbed surface layers are removed by cathodic treatment in dilute sulfuric acid.

25. The process according to claim 1, wherein dental tools are used to consolidate the powders, foils or sheets into net shape.

26. The process according to claim 1, wherein roll bonding is used to consolidate or weld a first metal or alloy together with a second metal or alloy, said second metal or alloy being different from the first metal or alloy.

27. The process according to claim 1, wherein isostatic pressing is used to consolidate the powders, foils or sheets.