

bonding was observed between bone and implants at either 11 or 18 days after implantation. After 40 days of implantation, however, two implants out of two passed the mini pushout test for bonding. One of these implants were sectioned, and microscopic examination showed that a direct chemical bond had formed between the Thirsty Glass implant and the healing bone.

EXAMPLE 2

The dry Portland cement used in this experiment was American Society for Testing Materials Type II Portland cement. Hardened samples were made by adding water to cement at a water to cement ratio of 0.4 and allowing the mix to harden for about two weeks to thirty days. After hardening, 4x4x1 mm. implants were fabricated from the cement. These were wet polished using 320 and 600 grit silicon carbide polishing discs. The implants were then rinsed in distilled water and allowed to remain in the rinse solution until implanted. In vivo testing for bonding to bone was performed using the rat tibial mini pushout procedure known to the art. No bonding was observed after 10 and 13 days implantation. After 28 days implantation, however, two samples out of two passed the mini pushout test for bonding. After 69 days implantation one sample out of one passed the mini pushout test. After 92 days implantation one sample out of one passed the mini pushout test. Qualitative mechanical testing of the implant-bone junction after 92 days showed fracture within the bone or the implant but not at the interface between the materials. Microscopic examination showed a direct chemical bond between the prehardened Portland cement implants and the healing bone.

What is claimed is:

1. A dental or surgical implant having a surface for bonding to the bone of a recipient, said bonding surface comprising a biologically compatible glass, glass-ceramic or ceramic material comprising at least about 80 weight percent silicon dioxide and having a specific surface area of at least about 80 square meters per gram, a porosity of from about 10 to about 50 volume percent, and an average pore diameter of from about 20 to about 300 Angstroms.

2. An implant of claim 1 wherein said material contains less than about 1 weight percent calcium and less than about 0.1 weight percent phosphorus.

3. An implant of claim 2 wherein said material comprises at least about 95 weight percent silicon dioxide.

4. An implant of claim 1 wherein said material comprises up to about 20 weight percent boron oxide.

5. An implant of claim 4 wherein said material is a glass.

6. A dental or surgical implant having a surface for bonding to the bone of a recipient, said bonding surface comprising a biologically compatible inorganic material capable of developing a porous silica-rich surface layer having a specific surface area of at least about 80 square meters per gram within about ten days' exposure to aqueous tris(hydroxymethyl)aminomethane buffer at a pH of 7.2 and a temperature of 37° C., said material being other than a silicon dioxide-based glass or glass-ceramic containing less than about 80 weight percent silicon dioxide.

7. An implant of claim 6 wherein said material is a hardened inorganic cement.

8. An implant of claim 7 wherein said cement is hardened Portland cement.

9. An implant of claim 6 wherein said material is a ceramic.

10. In a process for the fixation of a dental or surgical implant to bone comprising placing a wet cement between the surfaces of bone and implant and allowing said cement to harden, the improvement which comprises using a biologically compatible inorganic cement which, in the hardened state, is capable of developing a porous silica-rich surface layer having a specific surface area of at least about 80 square meters per gram within about ten days' exposure to aqueous tris(hydroxymethyl)aminomethane buffer at a pH of 7.2 and a temperature of 37° C.

11. The improvement of claim 10 wherein said cement is Portland cement.

12. The improvement of claim 10 wherein said wet cement is mixed with particles of a biologically active silicon dioxide-based glass or glass-ceramic.

13. The improvement of claim 10 wherein the bonding surface of said implant in contact with said cement comprises a biologically active silicon dioxide-based glass or glass-ceramic material.

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