carbonized and burned off, the alcohol is vaporized, and the aluminum hydroxide is thermally decomposed to form an alumina type ceramic 7 such as γ- or δ-alumina which can be filled into the pores of the aforesaid ceramic layer 5.

Procedure 3:

In the first step, flat and wavy substrates 1 and 2 are prepared in the same manner as in the aforesaid procedure 1. In the second step, the substrates 1 and 2 are alternately laminated, and the resulting laminate is subjected to secondary firing to prepare a unit structure. In the third step, the said unit structure is immersed in a slurry comprising a 50:50 mixture of an organic material and a ceramic material to coat the slurry on the surface of each of the substrates 1 and 2 constituting the unit structure. In the fourth step, the slurry-coated unit structure is subjected to tertiary firing at 1,100° to 1,600°C for 1 hour, whereby the orgnic material is carbonized and burned off to form a porous ceramic layer 5 on the surface of each of the substrates 1 and 2. In the fifth step, the unit structure having the aforesaid porous ceramic layer 5 is immersed in a slurry prepared by mixing together aluminum hydroxide or the like aluminum compound, phenol resin and alcohol. In the sixth step, the said unit structure is dried and then subjected to fourth firing at 800°C for 30 minutes, whereby the phenol resin is carbonized and burned off, the alcohol is vaporized, and the aluminum hydroxide is thermally decomposed to form an aluminum type ceramic 7 having a large specific surface area such as γ- or δ-alumina which can be filled in the pores 6 of the aforesaid ceramic layer 5.

According to the above-mentioned procedure 1, the ceramic structure is produced by forming porous ceramic layers on substrates composed of a ceramic material, and filling a substance having a large specific surface area into the pores of said ceramic layers. Accordingly, there are attained such excellent effects that the ceramic structure can be increased in resistance to mechanical and thermal impacts, and the substance having a large specific surface area does not come off from said substrates to make it possible to greatly enhance the durability of the ceramic structure.

According to procedure 2 of the second embodiment, the ceramic structure is produced through the step in which flat and wavy substrates are molded from a ceramic material, the step in which the said flat and wavy substrates are immersed in a mixed slurry composed of an organic material and a ceramic material, the step in which the immersed substrates are alternately laminated and the resulting laminate is fired at a high temperature to prepare a construction, and the step in which the said construction is immersed in an alumina type ceramic solution and then fired to firmly adhere the alumina type ceramic onto the surface of said construction. Since the firing temperature of the flat and wavy substrates and that of the mixed slurry are close to each other, there are attained such effects that two of the production steps can be reduced to one step, and an inexpensive ceramic structure can be produced.

According to procedure 3 of the second embodiment, the ceramic structure is produced through the step in which flat and wavy substrates are molded from a ceramic material, the step in which the said flat and wavy substrates are alternately laminated and the resulting laminate is fired at a high temperature to prepare a construction, the step in which the said construction is immersed in a mixed slurry composed of an organic material and a ceramic material, the step in which the immersed construction is fired, and the step in which the said construction is immersed in an alumina type ceramic solution and then fired to firmly adhere the alumina type ceramic onto the surface of said construction. Accordingly, there are attained such prominent effects that operations during the production steps are easy and a ceramic structure having excellent resistance to mechanical and thermal impacts can be obtained in a high yield.

What is claimed is:

1. A process for producing a ceramic structure which comprises forming in a first step optional-shaped substrates with a mixture of a ceramic material, an organic material and a solvent capable of dissolving said organic material and then firing said substrate; in a second step laminating said substrates to form a structure having fluid passages between said substrates; in a third step dipping said structure in a slurry consisting of the same ceramic material as the ceramic material in the first step, the organic material being present in a greater amount than that employed in the first step and a solvent capable of dissolving said organic material; in a fourth step firing said dipped structure to form a porous ceramic layer on the internal and external surfaces of said structure; in a fifth step dipping said structure having said porous ceramic layer in a liquid containing an aluminum compound which can be transformed to γ- or δ-Al_2O_3 by thermal decompostion to fill the pores in said layer with said aluminum compound and then firing said structure to thermally decompose said aluminum compound to γ- or δ-Al_20_3. O

2. A process according to claim 1 in which said ceramic material is a powder containing predominantly ceramic materials selected from the group consisting of cordierite, alumina, mullite, beryllia, zircon, zirconia, titanium oxide, crystallized glass, silicon nitride, aluminum nitride, titanium boride, boron carbide and silicon carbide.

3. The process of claim 2 wherein the priming firing is effected at 500° to 1200°C.; and the secondary firing is effected at 500° to 1600°C.

4. The process of claim 2 wherein the primary firing is effected at 500° to 1200°C. and the secondary firing is effected at 500° to 1600°C.

5. A process for producing a ceramic structure which comprises forming in a first step optional-shaped substrates with a mixture of a ceramic material, an organic material and a solvent capable of dissolving said organic material and then firing said substrate; in a second step dipping said structure in a slurry consisting of the same ceramic material same as the ceramic material in the first step, the organic material being present in a greater amount than that employed in the first step and a solvent capable of dissolving said organic material; in a third step laminating said substrates to form a structure having fluid passages between said substrates; in a fourth step firing said dipped structure to form a porous ceramic layer on the internal and external surfaces of said structure; and in a fifth step dipping said structure having said porous ceramic layer in a liquid containing an aluminum compound which can be transformed to γ- or δ-Al_2O_3 by thermal decomposition to fill the pores in said layer with said aluminum compound and then firing said structure to thermally decompose said aluminum compound to γ- or δ-Al_2O_3.

6. A process according to claim 5 in which said ceramic material is a powder containing predominantly