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Liquid phase sintering of zirconia using magnesium aluminum silicate(MAS) glass

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The sintering behavior and mechanical properties of magnesium aluminum silicate(MAS) glass added, 3 wt% Yittria stabilized zirconia (YSZ3) is investigated in this study. High purity yittria stabilized zirconia and MAS glass powders were used as starting powders. Magnesium aluminum silicate glass (17.5 MgO, 21.5 Al2O3 and 61.0 SiO2 in wt.%) proved to be effective in reducing the sintering temperature of YSZ3. The composite made by wet mixing the MAS and Yittria stabilize zirconia powder using ethanol, dried, sieved and uniaxially pressed. The samples were sintered in air at 1200 °C, 1300 °C, 1400 °C and at 1450 °C for 120 min, with heating and cooling rates of 10 °C/min to determine the optimal condition for liquid-phase sintering of zirconia with MAS glass additive. Sintered samples were characterized by relative density, X-ray diffraction(XRD) and scanning electron microscopy (SEM). The YSZ3 samples doped with 0.5 wt.% MAS can reach 97% theoretical density (TD) at 1400°C in 5 h. Optimum firing temperatures in the sintering of MAS-doped samples are found to be around 1400°C. Higher sintering temperatures result in a density drop which is attributed to formation of porosity and/or the early onset of solid state sintering at elevated temperatures. The hardness of pure and MAS glass added YSZ3 are studied using Vicker's Indenter. Glassy additives will form amorphous grain boundary phases plays an important role in micro structural development during sintering and also influence the properties of the sintered zirconia.

Keywords: Zirconia, MAS glass

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Silicon/Strontium이 도핑된 BCP 뼈 이식제가 조골세포 및 파골세포에 미치는 영향

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초음파 에너지를 사용하여 합성된Silicon/Strontium이 도핑된 HAp 나노 분말을 합성 한 후 다중압출공정으로 과립형의 다공질 BCP 뼈 이식제를 제조하였다. 이들 뼈이식제가 조골세포 및 파골세포에 미치는 영향을 살펴보기 위해 조골세포(MG-63)와 파골세포(Raw 264.7)의 활성 양상을 살펴보았다. 각 뼈 이식제에 의해 나타나는 조골세포와 파골세포의 유전자 발현 양상을 확인하기 위해 RNA를 분리하여 cDNA를 합성한 후 RT-PCR을 수행하였다. 또한 토끼의 대퇴골에 각각의 뼈 이식제를 이식한 후 이들의 골유도능과 생분해성을 Micro-CT를 사용해 관찰하였으며, 이에 따른 연구 결과를 보고하고자한다.

Keywords: Si and Sr doped BCP Bone Substitute, Osteoblast, Osteoclast