ARTIFICIAL BONE BY ZIRCONIA FIBER REINFORCED COMPOSITES

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ABSTRACT: Zirconium oxide fibers products by Zircar Zirconia have high temperatures strength and a high resistance against chemical agents. The thicker zirconia colloid is created using the high-tech "colloid method," spun into a fibrous embryo body, and then changed into zirconia polycrystalline fiber using a combination of dehydration, drying, medium- and high-temperature heat treatment, among other procedures. It has a 99.5% ZrO_2+Y_2O_3 chemical composition. Zirconia fiber can withstand temperatures as high as 2200°C. This article provides a zirconia fiber reinforced ceramic matrix composite artificial bone and a preparation method thereof, belonging to the technical field of biomedical materials. The artificial bone is an artificial biological material which can replace human bones or repair bone tissue defects, can be used for forming new bones by supplementing certain ions from human body fluid, and can perform reactions such as decomposition, absorption, precipitation and the like on a bone bonding interface to realize firm bonding of the bones. When it is necessary to replace a joint or treat a bone fracture, the most desirable way is to achieve self-repair of the bone through a tissue regeneration function. However, in many cases, the human bone cannot achieve self-repair, and the development of an ideal artificial bone material is an important subject in the fields of medicine and biomaterial science. With the rapid development of medical science, material science and advanced manufacturing technology, the requirements of people on the repair and replacement of fracture defects are increasingly improved, and the artificial bone manufacturing technology is also fully applied. However, the existing artificial bone ceramic material has the defects of high brittleness and poor fatigue resistance. The present article aims to provide a zirconia fiber reinforced ceramic matrix composite artificial bone and a preparation method thereof. The artificial bone made of the zirconia fiber reinforced ceramic matrix composite material can give consideration to both hardness and ductility and poor toughness.

Zirconium oxide powder is taken as a raw material. The zirconium oxide powder is added into molten Polycarbonate (PC) to prepare homogeneous gel with zirconium oxide, heating is carried out, the PC in the homogeneous gel with zirconium oxide volatilizes at a high temperature of 2700-3000^o C. The zirconium oxide in the homogeneous gel with zirconium oxide melts at a temperature of 2700-3000 ℃. The fiber is prepared by mixing the cotton with zirconia powder, then mixing, isostatic pressing and sintering, wherein the sintering process changes the forming direction of zirconia crystal cells, so that the impact strength of the zirconia fiber reinforced ceramic matrix composite artificial bone is improved, the impact strength is 1272.6-1310.8 MPa, the hardness is 1059-1107 HV, the bending strength is 1658.8-1752.6 MPa, and the toughness is 30.1-35.2 MPa x m1/2.

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