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PEEK Compounds' Compressive Behaviour in Medical Restorations

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Description

The thermoplastic polymer poly-ether-ether-ketone is well-known for its ability to substitute metallic components. It is a feasible alternative to traditional implant materials such as titanium in the field of orthopaedics and traumatology because of its elastic modulus, which is similar to that of cortical bone. PEEK is also being utilised to replace traditional dental materials in the field of dentistry, where a wide range of alloplastic materials are usually employed. This is linked to a number of issues.

Aside from hypersensitivities to certain components of dental composites, titanium, a well-known biocompatible metal, has lately been linked to inflammatory responses. Furthermore, an increasing number of patients choose metal-free reconstructions to prevent the danger of oral galvanism, for example. PEEK may represent a feasible biomaterial, capable of replacing not only ordinary polymers, but also metals, alloys, and ceramics in the area of dentistry, due to its mechanical capabilities, which may be changed by adding other compound materials such as carbon fibres.

Because the load distribution corresponds to a three-unit bridge in theory, the goal of this work was to analyse the mechanical characteristics of several commercial PEEK compounds using threepoint-bending tests. Titanium and its alloys have exceptional corrosion resistance, biocompatibility, and repassivation qualities, making them ideal for dental implants. Micromotion of dental implants, cyclic loading, and acidic oral environments cause the oxide covering on the implant's surface to break down over time, exposing the metal to electrolytes.

As a result, Ti and metallic ions are released into the oral environment, triggering an immune response focused primarily towards the implant. Ti had a far greater modulus of elasticity than bone. Due to inadequate stress shielding, bone resorption, and implant fracture, this significant discrepancy frequently leads in implant failure. Metallic dental implants emit scattering rays that are damaging to tissues when exposed to irradiation. Polyetheretherketone is a synthetic organic polymeric substance that was created.

It is a forerunner in the polymer family of poly-aryl-ether-ketones, with a temperature stability of more than 30°C. It is chemically resistant, has excellent mechanical qualities, and is biocompatible. It has a lot of compatibility with today's imaging technology. It is a tooth-colored substance that has lately been employed as a dental implant material in cases where aesthetics are important. Implant superstructures, abutments, and implant fixtures are all made of PEEK. PEEK has a Young's modulus of 3.6 GPa in its pure form, 18 GPa in carbon-reinforced PEEK, and 12 GPa in glass fiber-reinforced PEEK.

PEEK displays less stress shielding than Ti because its Young's modulus is close to that of the cortical bone. Because hydrophobic surfaces inhibit cellular attachment, cells must interact with surrounding tissues via a somewhat hydrophilic surface. Most polymers have low surface energy, making them bioinert. PEEK is also bioinert, with no osseoconductive qualities engrained in it. PEEK encourages less osteoblast differentiation than Ti, according to research.

PEEK has been coated and combined with bioactive particles in an attempt to improve its osseoconductive characteristics. PEEK materials' surface properties have been improved and made more biocompatible through various alterations. Nanoparticles in the form of Titanium dioxide, HAp, and HAF were mixed with PEEK to make bioactive nanocomposites, and chemical changes were made to increase the surface roughness of the PEEK material in an attempt to promote early osseointegration of the implant. This systematic review looked at experimental, animal, and clinical investigations on PEEK materials to see if they have good qualities and can improve osseointegration, allowing them to be utilised in dental implants [1-5].

Conflict of Interest

None.

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