

## INTISARI

### FABRIKASI DAN KARAKTERISASI KOMPOSIT *POLYETHERETHERKETONE (PEEK)/HIDROKSIAPATIT (HA)* KERANG MUTIARA UNTUK IMPLAN TULANG

Penelitian ini bertujuan untuk memperoleh komposit *Polyetheretherketone* (PEEK), dengan Hidroksiapatit (HA) berbahan dasar kerang mutiara untuk aplikasi implan tulang. HA diperoleh melalui bahan biogenik kerang Mutiara yang diproses menjadi serbuk CaO untuk kemudian dilakukan sintesis HA melalui metode presipitasi. Serbuk HA dengan variasi konsentrasi (0%, 10%, 20%, 35%, dan 50% w/w) kemudian dikompositkan dengan PEEK melalui metode *mechanical mixing*. Karakteristik fisiko-kimia dan mekanik dari komposit PEEK/HA akan dianalisis menggunakan *X-ray Diffraction* (XRD), *Fourier-Transform Infrared Spectroscopy* (FTIR), *Scanning Electron Microscopy* (SEM), dan uji kekerasan (*Microhardness test*). Hasil XRD menunjukkan keberadaan puncak PEEK dan HA yang memiliki ukuran kristalit 8,9-10,5 nm, dan kristalinitas 63,9-70,8%, sedangkan hasil dari FTIR menunjukkan kehadiran pita serapan PEEK, dan pita serapan HA diwakili oleh gugus fungsi  $PO_4^{3-}$ . Berdasarkan hasil SEM didapatkan morfologi permukaan komposit yang menjadi semakin padat saat konsentrasi HA semakin meningkat, dengan porositas 46,8-33,1% dan ukuran pori 80,5-57,5 nm. Uji mekanik *microhardness* memiliki nilai 29,3-35,2 HV yang menandakan bahwa komposit PEEK/HA lebih tahan terhadap goresan, abrasi, dan penetrasi dibandingkan dengan PEEK murni. Berdasarkan hasil penelitian sampel PEEK/HA10 merupakan sampel paling optimal karena sifat bioaktivitas, porositas dan persebaran pori yang merata serta hasil dari berbagai karakterisasi yang paling mendekati dengan referensi.

**Kata kunci :** Hidroksiapatit, Kerang Mutiara, *Polyetheretherketone*, Rekayasa Jaringan Tulang, *Scaffold*.

## ABSTRACT

### **FABRICATION AND CHARACTERIZATION OF POLYETHERETHERKETONE (PEEK)/HYDROXYAPATITE (HA) PEARL SHELL COMPOSITE FOR BONE IMPLANTS**

This study aims to develop a composition of polyetheretherketone (PEEK) with hydroxyapatite (HA) derived from pearl shells for bone implant applications. HA is obtained from biogenic pearl shell material, which is first processed into CaO powder and then synthesized into HA via a precipitation method. HA powder at varying concentrations (0%, 10%, 20%, 35%, and 50% w/w) is then combined with PEEK using a mechanical mixing method. The physicochemical and mechanical properties of the PEEK/HA composite are analyzed using X-ray Diffraction (XRD), Fourier-Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), and microhardness testing. The XRD results reveal the presence of PEEK and HA peaks, with crystallite sizes ranging from 8.9 to 10.5 nm and crystallinity between 63.9% and 70.8%. FTIR analysis confirms the presence of PEEK absorption bands, while HA is identified by the characteristic  $\text{PO}_4^{3-}$  functional group. SEM observations show that the composite surface becomes increasingly dense with higher HA concentrations, with porosity decreasing from 46.8% to 33.1% and pore size ranging from 80.5 to 57.5 nm. Microhardness testing yields values between 29.3 and 35.2 HV, indicating that the PEEK/HA composite is more resistant to scratching, abrasion, and penetration than pure PEEK. Among the tested samples, PEEK/HA10 is identified as the most optimal, exhibiting favorable bioactivity, appropriate porosity, uniform pore distribution, and characterization results that most closely align with reference standards.

**Keywords:** Bone Tissue Engineering, Hydroxyapatite, Pearl Shell, Polyetheretherketone, Scaffold.