IOCFB 2024 Conference
The 1st International Online Conference on Functional Biomaterials
10–12 July 2024 | Online

Surface decoration of PEEK implants with IGF-1 via polydopamine enhances osseointegration and osteogenic differentiation

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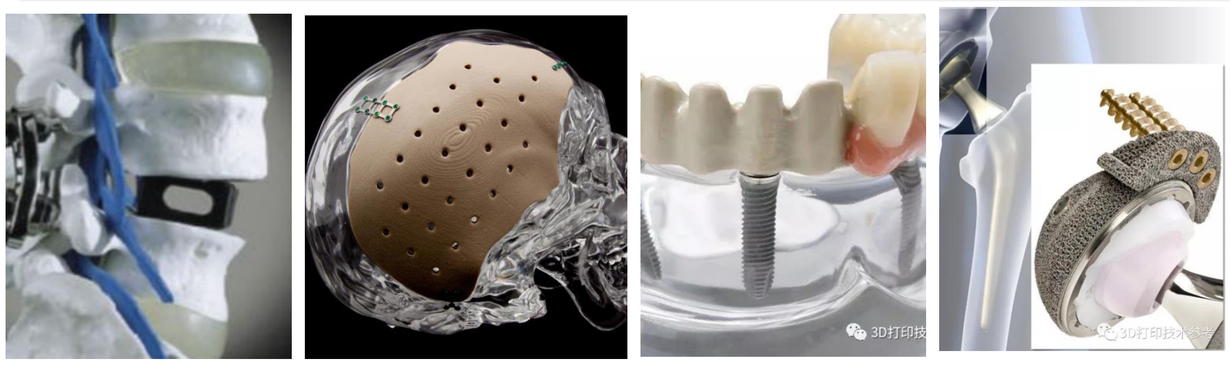
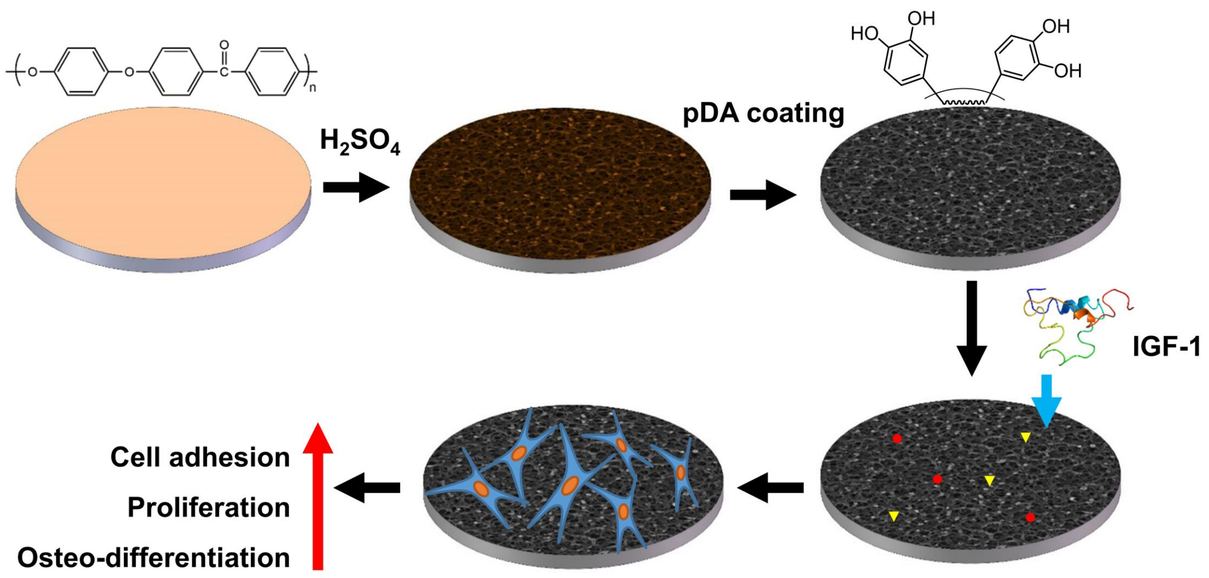
INTRODUCTION & AIM



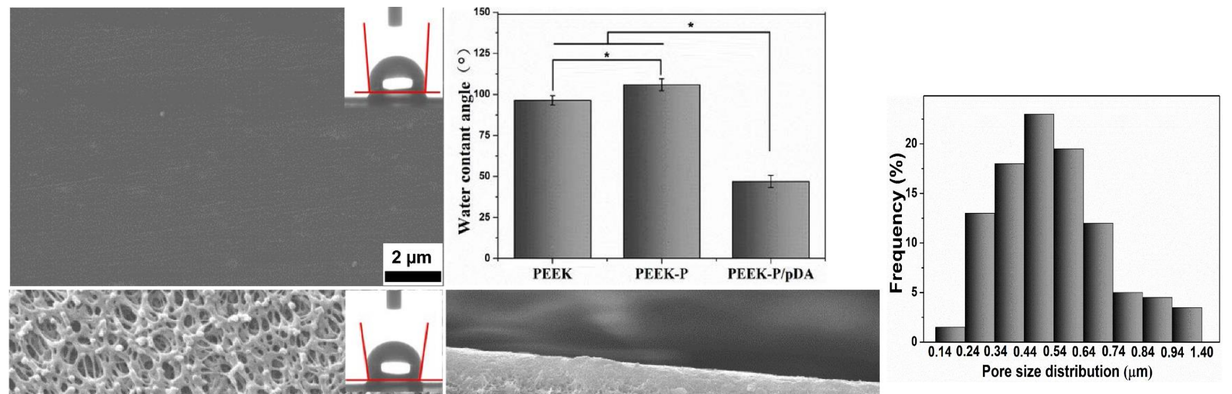
Polyetheretherketone (PEEK) is a promising biomedical material in orthopedic and dental applications owing to its excellent mechanical properties, near absent immune toxicity, and X-radiolucency, but suffers from bio-inertness and inferior osteoconduction. Surface modification of PEEK can effectively solve this problem, retaining most of its advantageous properties. In this study, porous structures were fabricated using concentrated sulfuric acid and the interface was bio-functionalized by IGF-1 immobilization on the porous surface via polydopamine coating.

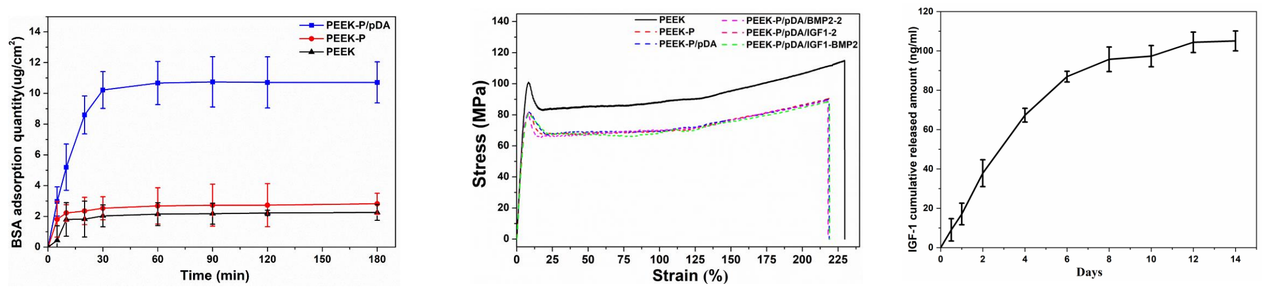
METHOD

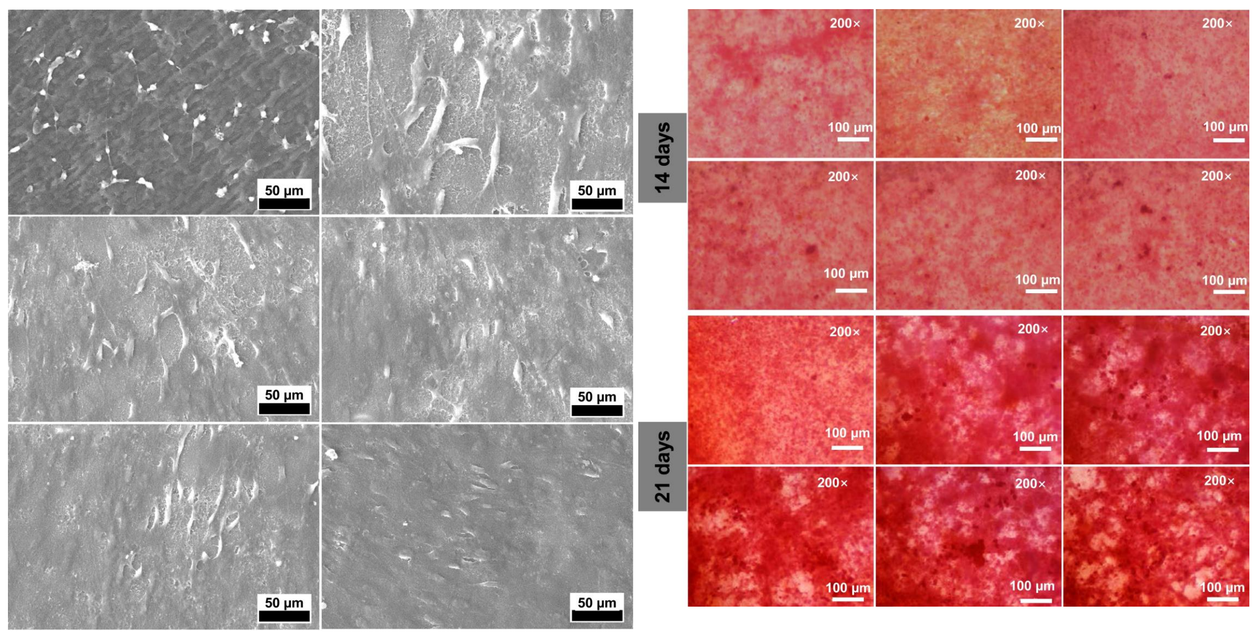


1. The porous 3D porous structure on the surface of the PEEK implant was obtained by immersion of concentrated sulfuric acid.
2. Surface modification with polydopamine coating significantly enhances the hydrophilicity of PEEK bone implants and serves as an intermediate layer for the effective immobilization of IGF-1. This functional characteristic improves the biocompatibility and bioactivity of the implants, thereby promoting bone tissue integration and regeneration.
3. Insulin-like Growth Factor-1 (IGF-1) plays a critical role in bone repair. IGF-1 significantly accelerates the fracture healing process by promoting the proliferation and differentiation of osteoblasts and enhancing the synthesis of bone matrix.

RESULTS & DISCUSSION







CONCLUSION

These findings indicate that IGF-1 modification on the surface of PEEK implants using pDA as an intermediate layer can significantly enhance the osseointegration and osteogenic differentiation potential of PEEK, which has great potential for clinical application.

FUTURE WORK / REFERENCES

This research was financially supported by Cross-cooperation project of Beijing Science and Technology New Star Program (Project: 20220484233);