

Bone matrix

The **bone** matrix, also known as the **extracellular matrix** of bone, is a complex and dynamic tissue that provides support, protection, and mineral storage to the body. It primarily comprises collagen fibers and hydroxyapatite crystals, which give bone strength and rigidity. The bone matrix also contains various types of cells, such as osteoblasts, osteoclasts, and osteocytes, that work together to maintain bone structure and function. The composition and organization of the bone matrix can be influenced by various factors, such as hormones, mechanical stress, and disease.

Integrating a **biomimetic extracellular matrix** to improve the **microenvironment** of **3D printing scaffolds** is an emerging **strategy** for **bone substitute** design.

A “soft-hard” bone implant (BM-g-DPCL) consisting of a **bioactive matrix** chemically integrated on a **polydopamine** (PDA)-coated porous gradient scaffold by polyphenol groups is constructed. The PDA-coated “hard” **scaffolds** promoted Ca²⁺ chelation and mineral deposition; the “soft” bioactive matrix is beneficial to the **migration**, **proliferation**, and osteogenic differentiation of **stem cells in vitro**, accelerated endogenous **stem cell** recruitment and initiated rapid **angiogenesis** in vivo. The results of the **rabbit cranial defect model** ($\Phi = 10$ mm) confirmed that BM-g-DPCL promoted the integration between **bone tissue** and **implant** and induced the deposition of **bone matrix**. **Proteomics** confirmed that **cytokine** adhesion, biomineralization, rapid **vascularization**, and **extracellular matrix** formation are major factors that accelerate **bone defect healing**. This strategy of highly chemically bonded soft-hard components guided the construction of the bioactive regenerative scaffold ¹⁾.

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Liu Q, Chen M, Gu P, Tong L, Wang P, Zhu J, Xu Y, Lu G, Luo E, Liang J, Fan Y, Zhang X, Sun Y. Covalently Grafted Biomimetic Matrix Reconstructs the Regenerative Microenvironment of the Porous Gradient Polycaprolactone Scaffold to Accelerate **Bone Remodeling**. *Small*. 2023 Feb 11:e2206960. doi: 10.1002/smll.202206960. Epub ahead of print. PMID: 36772909.

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