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## **Carbon fibers with a nano-hydroxyapatite coating as an excellent biofilm support for bioreactors**

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Abstract: A biofilm support with high biocompatibility is needed for bioreactors. A nano-hydroxyapatite (HA) coating on carbon fibers (CFs) was prepared by electrochemical deposition (ECD). The sludge immobilization assays, bacterial cells adhesion assays and Derjaguin –Landau –Verwey –Overbeek (DLVO) theory were used to evaluate the capacity of CF supports to immobilize activated sludge and bacterial cells. The sludge immobilization and bacterial cells adhesion assays illustrated that HA coating could enhance the capacity of CFs to immobilize microorganisms. SEM images showed that HA and bacterial cells formed a dense film on CFs surface. In addition, HA, acting as a glue, could combine CFs with bacterial cells or between cells, which helped CFs capture more bacterial cells. DLVO theory illustrated that CFs with HA coating had a lower total interaction energy than CFs without handling, explaining the higher capacity of CFs with HA coating to immobilize bacterial cells. This result was owing to the less negative zeta potential and higher hydrophilicity of CFs with HA coating, and the hydrophilicity made a greater contribution to the lower total interaction energy. Experiments and theory reveal that HA coating could enhance the biocompatibility of CFs, and CFs with HA

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