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A new material for replacing the material of construction of textile-bioreactors

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This paper introduces a new material for making structural composites for construction of textile-bioreactors (TBRs). The concept is a facile process to make a water-/gas-proof composite, which is prepared as a replacement of the conventional stainless steel or concrete-based bioreactors. The composite is made out of one single material: polyamide (Nylon), hence we call it all-polyamide composite coated-fabric (APCCF). The material characteristics, as well as the fermentation process performance of the APCCF-TBR, was compared with a TBR made using the polyvinyl chloride (PVC)-coated polyester fabric (PVCCF). The TBRs were used for the anaerobic fermentation process using baker's yeast; and, for aerobic fermentation process using filamentous fungi, primarily by using waste streams from ethanol industries as the substrates. The techno-economic analysis conducted using a 5000 m3 APCCF-TBR for a typical fermentation facility would lead to a reduction of the annual production cost of the plant by $128,000,000 when compared to similar processes in conventional bioreactors. The comparative analyses (including mechanical and morphological studies, density measurements, thermal stability, aging, and techno-economic analyses) revealed that the APCCF is a better candidate for the material of construction of the TBR.

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