
Cyanobacteria-Embedded Biopolymer Hydrogels for Marine Antifouling

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Abstract

Marine biofouling poses significant economic and ecological challenges, and traditional antifouling methods rely on toxic compounds, driving the search for environmentally friendly antifouling strategies (1). Cyanobacteria produce diverse bioactive compounds with antifouling properties (2), and hydrogels offer a biocompatible matrix for their delivery, besides also being effective in resisting the adhesion of proteins and fouling organisms (1,3). The aim of this study is to investigate the potential of incorporating cyanobacteria in hydrogels as a novel antifouling approach.

Bio-based hydrogels were prepared using physical crosslinking and embedded with antifouling cyanobacteria strains (**Figure 1**). The composites were monitored for six weeks to assess physical stability, cell viability (via fluorescence microscopy), and secretion of antifouling compounds (via LC-MS/MS).

Strains showed varying compatibility with the hydrogels, with some promoting gel degradation. Cyanobacteria remained viable and secreted bioactive metabolites into the medium.

Further work will focus on improving the hydrogels mechanical properties and assessing the antifouling efficacy of these composites. This study highlights key design considerations for future bio-based marine coatings.

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