ARTICLE | March 4, 2026

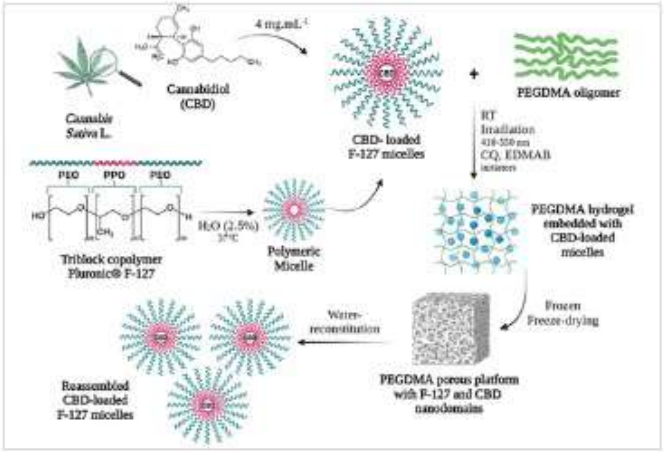
From Water-Based Cannabidiol Formulations to Porous PEGDMA Platforms: A Material Approach Toward Transdermal Delivery Using Polymeric Micelles

Luciana Mentasti*, Luciano Protti Cosenza, Fernando Pschunder, Facundo C. Herrera, Agustina Fernández, Alexander Peter Aguila Wharton, Ignacio Scandura, Luisa Franchi, Osvaldo Fornaro, Romina J. Glisoni, Ileana Zucchi, and Gastón Pablo Barreto

Access Through Your Institution | Other Access Options | Supporting Information (1)

Abstract

The incorporation of cannabidiol (CBD)-loaded micelles into polymeric platforms is a key step in developing materials intended for the transdermal delivery of this lipophilic compound. In this work, CBD-loaded Pluronic micelles (F-127 and F-108) were prepared and characterized, revealing superior encapsulation efficiency for F-127, consistent with its higher hydrophobicity and larger PPO core. ATR-FTIR, DLS, and SAXS confirmed successful drug loading, micelle stability, and structural reorganization with increasing CBD content. Subsequently, poly(ethylene glycol) dimethacrylate (PEGDMA) networks were obtained in the presence of CBD-loaded and blank micelles. FESEM revealed enhanced porosity and granular domains in CBD-loaded matrices, while preliminary DMA analyses indicated a predominantly elastic response and higher stiffness in those samples. DSC indicated interactions between micelles and the cross-linked polymer network, while SAXS revealed nanodomains derived from the embedded micelles, providing insight into the structure of porous PEGDMA material. Freeze-drying followed by water reconstitution showed that CBD-loaded micelles reassembled after their release from the PEGDMA matrix. Taken together, DLS, SAXS, and DSC evidenced efficient micelle recovery, minimal structural alteration, and negligible copolymer retention within the network. These results demonstrate that PEGDMA matrices can host CBD-loaded micelles while preserving their structure after processing, supporting their potential use as transdermal delivery materials.



© 2026 American Chemical Society