

Review Article

DEVELOPMENT OF MICROSPONGES FOR TOPICAL FORMULATION: A REVIEW

Chauhan Parth Pintubhai

Smt. Champaben Vasantbhai Gajera Pharmacy Mahila College, Amreli, GTU, Ahmedabad 365601

Microsponges are advanced, highly porous polymeric microspheres designed for controlled and sustained topical drug delivery. Their unique sponge-like architecture allows high drug loading capacity, localized delivery, and prolonged release of active pharmaceutical ingredients, minimizing systemic absorption and reducing adverse effects. This review provides comprehensive guidance on the development of microsphere-based topical formulations, covering formulation strategies, preparation techniques, and critical characterization parameters. The advantages of microsponges in enhancing drug stability, improving therapeutic efficacy, and reducing skin irritation are discussed. Various fabrication methods, including quasi-emulsion solvent diffusion and suspension polymerization, are evaluated for their scalability and suitability in industrial applications. The review also highlights emerging frontiers such as stimuli-responsive release systems and hybrid nanoscale combinations aimed at enhancing targeted delivery and skin penetration. Furthermore, regulatory considerations, safety assessments, and recent clinical advancements are addressed. This article serves as an essential reference for researchers and formulators aiming to harness microsphere technology for innovative and effective topical therapies.

Keywords: Controlled release, Sustained release, Polymer microspheres, Nanotechnology, Dermatological applications, Stimuli-responsive delivery

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