vailable application field of CM-chitosan recent

Recent available application fields of carboxymethyl chitosan (CM-chitosan) span a broad range of biomedical, food technology, and environmental areas owing to its biocompatibility, biodegradability, and functional versatility.

Biomedical Applications

CM-chitosan is actively used in advanced drug delivery systems for bioactive agents including drugs, genes, and proteins due to its mucoadhesive, gelation, antibacterial, and antifungal properties. It enables controlled release and targeted delivery improving therapeutic efficacy. Additionally, it plays an important role in wound healing, especially in chronic wounds like diabetic foot ulcers, where CM-chitosan hydrogels loaded with antimicrobial peptides actively inhibit infection, reduce biofilms, and promote healing. It is also used in tissue engineering scaffolds and regenerative medicine, including liver regeneration and osteoarthritis treatment. [1] [2] [3] [4]

Food Industry

CM-chitosan is increasingly being incorporated in food technology for food safety and preservation. It contributes to antimicrobial food packaging, enhances texture and flavor retention, and improves shelf life of perishable goods by acting as a natural food hydrocolloid and antioxidant delivery system. [5] [6]

Anticancer and Nanotechnology

Novel nanocomplexes based on CM-chitosan have been developed for co-delivery of nutraceuticals like curcumin and resveratrol, increasing their bioavailability and stability. CM-chitosan nanoparticles loaded with polyoxometalates show promising anticancer activity, providing a multifunctional platform for cancer therapy and drug delivery research. [6] [7]

Environmental and Industrial Uses

Besides biomedical and food applications, CM-chitosan is investigated for anticorrosion coatings on metals, wastewater treatment to chelate heavy metals, and agricultural uses as a biodegradable biopolymer. [8]

In summary, the recent application fields of CM-chitosan prominently include pharmaceutical drug delivery and wound repair, food safety and preservation, cancer therapy nanocomposites, and environmental remediation, reflecting its continued growth as a sustainable and multifunctional material in 2025. [2] [3] [1] [5] [6]

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2. https://pubs.acs.org/doi/abs/10.1021/acsapm.5c02080
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