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Graft Modification of Natural Polysaccharides via Reversible Deactivation Radical Polymerization

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Abstract

Interest in the development of new hybrid materials based on natural polysaccharides has grown exponentially in the last decade. Such materials are commonly obtained by the graft modification of polysaccharides via reversible deactivation radical polymerization (RDRP). Research has focused on the use of RDRP techniques, including ATRP (atom transfer radical polymerization), NMP (nitroxide-mediated polymerization) and RAFT (reversible addition–fragmentation chain transfer polymerization), not only because of the good control over the molecular weight distribution that RDRP provides, but also because of the complex macromolecular architectures that can be achieved. This review highlights the most recent development, challenges, uses and applications of the polymer graft modification of several common natural polysaccharides (chitin, chitosan, alginate, dextran, starch and cellulose derivatives) via RDRP.

Abbreviations

[AMIM]Cl	1-allyl-3-methylimidazolium chloride
AGET	activator generated by electron transfer
AIBN	azobisisobutyronitrile
AMIMBr	1-allyl-3-methylimidazolium bromide
ATRA	atom transfer radical additions
ATRP	atom transfer radical polymerization
AuNPs	gold nanoparticles
BDACT	S,S′-bis(R,R′-dimethyl-R″-acetic acid)-trithiocarbonate acid))
BiBB	2-bromoisobutyryl bromide
BPATT	3-benzylsulfanyl thiocarbonylsulfanyl propionic acid
Bpy	bipyridyne
CCS	crosslinked chitosan
CNF	chitin nanofibers
CTA	chain transfer agent
CP/MAS NMR	cross polarization magic angle spinning nuclear magnetic resonance
DDACT	S-1-dodecyl-S′-(α$α′-dimethyl-α′′-acetic acid)trithiocarbonate
DDMAT	2-(dodecylthiocarbonothioylthio)-2-methylpropionic acid
CPADB	4-cyano-4-(phenylcarbonothioylthio)pentanoic acid
DES	deep eutectic solvents