

Advances in Biomedical Polymers and Composites

Materials and Applications

Advances in Biomedical Polymers and Composites Materials and Applications

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18.1 Introduction

Polymers have been present in nature since the advent of life (Namazi, 2017). Different polymers, including polysaccharides, nucleic acids (DNA and RNA), and proteins, have played roles in the biological world (Li, Lee, & Dziubla, 2015; Schnitzler & Herrmann, 2012; Zhang, Sun, & Jiang, 2018). Nowadays, starting from daily use to earth's most cutting-edge operations, polymers have invaded all the possible corners of applications due to their unique molecular arrangements and macromolecular chemistry (George, Sanjay, Srisuk, Parameswaranpillai, & Siengchin, 2020; Sahana & Rekha, 2018; Yang & Kopeček, 2014). The polymer industry is, hence, the fastest developing industry and brings around an invention every other day. Advancements in material sciences over the past decades have led to an exponential development in functional polymers for use in biomedical technology (Kandar, Hasnain, & Nayak, 2021; Maity, Hasnain, Nayak, & Aminabhavi, 2021; Nayak, Hasnain, Tabis, & Aminabhavi, 2021; Sahana & Rekha, 2018).

Since the last few decades, various composite materials have extensively been applied in diverse fields, including drug delivery, tissue engineering, foods, cosmetics, agriculture, textiles, optoelectronics, automobiles, and aerospace engineering (Hasnain & Nayak, 2019a; Hasnain et al., 2016; Hasnain, Ahmad, Chaudhary, Minhaj, & Nayak, 2019b; Hasnain, Ahmad, Minhaj, Ara, & Nayak, 2019; Mazumder, Nayak, Ara, & Hasnain, 2019; Nayak, Hasnain, Nanda, & Yi, 2019; Nunes, Coimbra, & Ferreira, 2018; Zagho, Hussein, & Elzatahry, 2018; Zhao et al., 2015; Reis, de Moura, & Samborski, 2020). Composites and nanocomposites are quite popular among various materials and biomaterials researchers due to their compelling features, unique “green” designs, ease of preparation, and cost-effectiveness (Zagho et al., 2018; Zhao et al., 2015). Composites are essentially multiphase materials, containing one material (in several forms, such as particles, fibers or sheets) embedded in another phase (Hasnain & Nayak, 2018a; Hasnain, Ahmad,