

Cutting-edge development in dendritic polymeric materials for biomedical and energy applications

Mohammad R. Thalji^a, Amal Amin Ibrahim^b, Gomaa A. M. Ali^c

^a Faculty of Industrial Sciences & Technology, Universiti Malaysia Pahang, Gambang, 26300 Kuantan, Malaysia

^b Polymers & Pigments Department, Chemical Industries Division, National Research Centre, El-Bohouth St, Dokki, Cairo 12622, Egypt

^c Chemistry Department, Faculty of Science, Al–Azhar University, Assiut 71524, Egypt

ABSTRACT

Dendritic polymers (dendrimers and hyperbranched polymers) are becoming increasingly popular due to their vast range of uses. Due to their distinctive and novel qualities, they have demonstrated a strong interest. Since its discovery, dendritic polymers have become a potential material for many research applications, ranging from biomedical and tissue engineering to catalytic and energy applications. Since then, dendritic polymers' unique features have become a promising platform for a variety of uses. Dendritic polymers have made great progress in overcoming basic and technological problems related to their biomedical and energy applications. This review summarizes the strategies of synthesizing dendrimers and hyperbranched polymers. Further, the review highlights the applications of dendrimers and hyperbranched polymers in many study fields such as drug delivery, gene delivery, tissue engineering, catalysis, and energy storage. This review concludes with future avenues to be explored for the applications of dendritic polymers.

KEYWORDS

Dendritic polymer; Dendrimers; Hyperbranched polymers; Drug and/or gene delivery; Energy storage

REFERENCES

1. Y. Ma, Q. Mou, D. Wang, X. Zhu, D. Yan
Dendritic polymers for theranostics; *Theranostics*, 6 (7) (2016), pp. 930-947
2. H. Li, J. Sun, H. Zhu, H. Wu, H. Zhang, Z. Gu, K. Luo
Recent advances in development of dendritic polymer-based nanomedicines for cancer diagnosis; *Wiley Interdiscip. Rev. Nanomed. Nanobiotechnol.*, 13 (2) (2021), pp. 1-28
3. M. Suraj Belgaonkar, B. Kandasubramanian
Hyperbranched Polymer-based Nanocomposites: Synthesis, Progress, and Applications; *Eur. Polym. J.*, 147 (2021), p. 110301
4. R.J. Smith, C. Gorman, S. Menegatti
Synthesis, structure, and function of internally functionalized dendrimers; *J. Polym. Sci.*, 59 (1) (2021), pp. 10-28
5. J.E. Durantini, R. Rubio, C. Solis, L. Macor, G.M. Morales, M.I. Mangione, D.A. Heredia, E. N. Durantini, L. Otero, M. Gervaldo
Electrosynthesis of a hyperbranched dendrimeric porphyrin polymer: optical and electronic characterization as a material for bifunctional electrochromic supercapacitors; *Sustain. Energy Fuels*, 4 (12) (2020), pp. 6125-6140