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POLYANILINE BASED COMPOSITES FOR SENSING DEVICES

PRADEEP GAIKWAD[1*]

[1]R.B. Attal Arts, Science and Commerce Georai Dist. Beed (M.S) India

***Corresponding Authur Email: pdgaikwad11@gmail.com.**

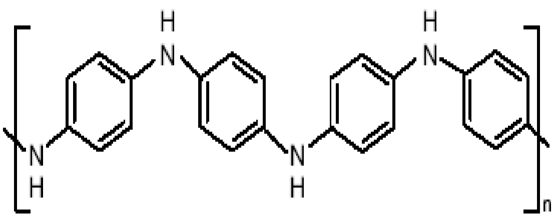
Abstract

Conducting polymers and its composite structure, preparative method and its properties develop specific functionality for the applications as different selective sensors. The commercialization of conducting polymer-based sensors for sensing devices has been highlighted.

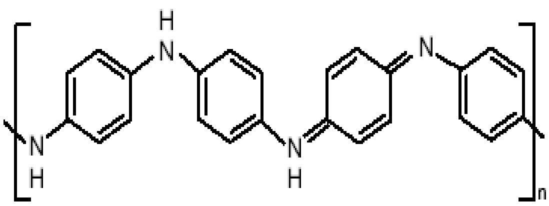
Keywords: Conducting polymer; Preparative methods; properties, applications.

1. Introduction

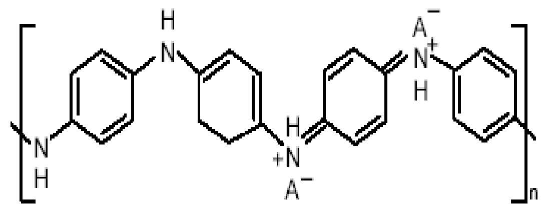
Conducting polymers (CPs) and its composites have drawn much attention for fabrication of different chemical sensors due to responsive properties and used for sensing purposes [1-2]. CPs based composites have applications in different sensing devices [3-5]. Sometime the presence of metal oxides in CPs, exhibit excellent magnetic and electro-magnetic radiation absorbing capacity and explored in many advanced devices [6]. The p r e p a r a t i o n n ofconducting polymer (CPs) and its composite chemical , electrochemical and photo-polymerization for fabrication of composites, in chemical sensors[7]. Polyaniline and its family are promising material for commercial applications because of its good environmental stability, electrochemical preparation and biocompatibility. Aqueous electrochemical process is an environment friendly and efficient technique being used for synthesis of conducting polymers. PANI and its family can often be used for biosensors, gas sensors, microactuators, antielectrostatic coatings, solid electrolytic capacitor, electrochromic windows, displays, packaging, polymeric batteries, electronic devices and functional membranes, etc [[8-12]. Polyaniline can be synthesized by both chemical and electrochemical oxidative polymerization [13-14]. Polyaniline exists in four main oxidation states viz. (i) Leucoemeraldine base, (ii) Emeraldine base (iii) Emeraldine salt and (iv) Pernigraniline, Schematic representations for which are shown in the Fig 1.



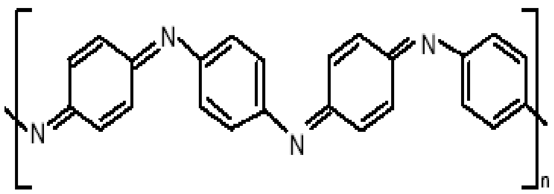
Leucoemeraldine



Emeraldine base



Emeraldine salt



Pernigraniline

Figure 1: Various oxidation states of Polyaniline

An academic, governmental and industrial laboratory throughout the world involves in the basic research and assessment of possible applications of conducting polymers that makes the conducting polymers an interdisciplinary area in nature. These conducting organic molecular electronic materials have attracted much attention largely because of their many projected applications as shown in Fig. 1.1

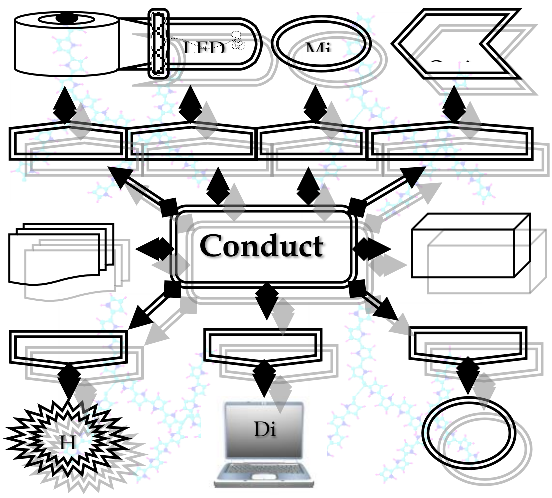
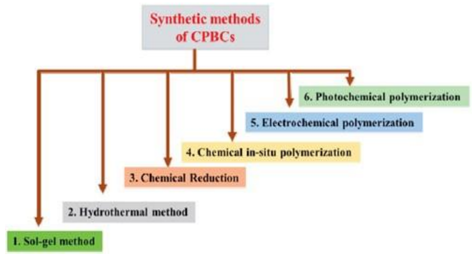


Fig. 1.1. Applications of conducting polymers

2.Perspective Method : The synthesis of polyaniline bio composites had much interest attracted due to their light weight, cost effective processibility and uniquely physicochemical properties, sensing behavior and magnetics Properties. The various techniques employed currently for the synthesis of Polyaniline, are shown in the following Figure 2..

Figure2: Synthesis of polyaniline nanocomposites.

Recent modification in synthetic routes are also widely explored to generate the functionality and nano structuring to optimize the conductivity, sensitivity, selectivity, processability,biodegradability, biocompatibility and ecofriendly behavior.



3. Classifications: Generally Polyaniline composites are classified on the basis of constituents, and thus all groups into i) Conducting and biopolymers ii) Biopolymer and metal oxide iii) Biopolymer and metals.

4. Applications: The advances in the properties of CBNCs, make it suitable for variety of applications in different industries like atmosphere, agriculture, analytical and biomedical. The brief class of applications of CBNCs are illustrated in Figure 3.

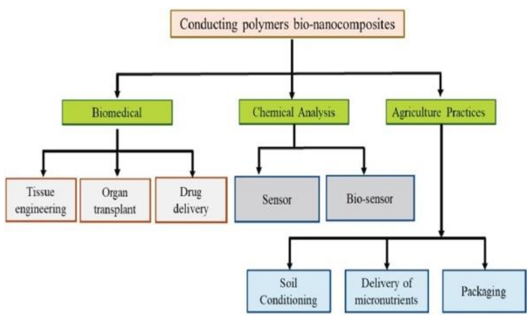


Figure 3: Applications of CBNCs.

5. Biomedical applications: The different 3iomedical technologies are considerably improved with use of different bio-nano composite [15] The important significantly improved biomedical techniques of CBNCs.

5.1. Tissue engineering: They fabricated the scaffolds by chemical method using two specific conductive polymers, PANI and PEDOT nanofibres in the collagen solutions. PANI and PEDOT nanofibres were found to be cyto compatible with both cell types and the best results (i.e. cell growth and gel electrical conductivity) were obtained the densities of both cell types were similar and comparable to collagen positive controls. PANI-gelatin blend nanofibers might provide a novel conductive material well suited as biocompatible scaffolds for tissue engineering [16].

5.2. Drug delivery: Drug delivery means to modify the drug release profile, absorption, distribution and benefit of improving product efficacy and safety due to their unique structure and properties.

Conclusion and Future prospects: Conducting polymer bio=nanocomposite provide an excellent opportunity for fabricating highly selective, biocompatible biomedical devices. to promote interdisciplinary cooperation and develop modern polymerization techniques that, improve toxicity and lower production costs.

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