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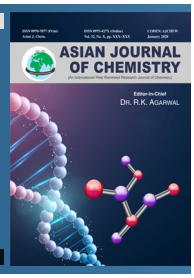

Synthesis of Ag@Polycarbazole Nanocomposite using Ferric Acetate as an Oxidant

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Silver nanowires and Ag@polycarbazole nanocables have been effectively fabricated. Polyol-reduction and ion adsorption process were used to fabricate pure silver nanowires and Ag@polycarbazole nanocomposite by using an oxidant (iron acetate). Ions of oxidant were adsorbed on the surface of pure silver nanowires to oxidize carbazole monomers for efficient polymerization. The morphology of nanowires and Ag@PCz composite were characterized by using SEM, FT-IR and photoluminescence analysis. The SEM shows the presence of a smooth polymeric sheath. FT-IR and photoluminescence analysis shows dominant peaks that indicate the presence of silver nanowires and polycarbazole (PCz) with a smooth polymeric coating. Nanoparticle analyzer was used to determine z-average and actual size of sample. UV-visible spectrum shows two bands that were dominant at 345 and 410 nm. These are π to π^* transitions that indicates the presence of polycarbazole nanocables.

Keywords: Silver nanowires, Polycarbazole nanocable, Oxidant, Ferric acetate.

INTRODUCTION

Metal polymer nanocomposites are efficient and stable materials for different high-tech applications. They have distinctive physical, photo-electrochemical and thermally stable properties [1]. Nanocomposites have potential applications for the fabrication of sensors in food testing and environmental safety monitoring. The metal-based polymer composites can be used to identify metal ions from different aqueous solutions. However, conjugated polymers retain their luminescence, magnetic and electrical characteristics. These properties can be enhanced by using nanocomposites of metal within the polymer matrix [2-4]. Silver is usually used in composites that show conductivity. Silver has high electrical conductivity and better resistance to oxidation. So, silver nanomaterial can be used to enhance properties of conducting polymers effectively. Among conducting and luminescent polymers, polycarbazole plays a significance role due to its electron-hole transporting properties [5] that enhance its application in light emitting diodes and electrochromic displays [6]. In the beginning, polymeric composites were synthesized by using poly(methyl methacrylate) [7], poly(vinyl pyrrolidone), poly (vinyl alcohol) and poly(vinyl acetate) [8]. However, in order to increase the conductivity further, conducting polymers were used to fabricate nanocables like Ag-polythiophene [9], Ag-polyaniline [10] and Ag-polypyrrol [11,12]. The main purpose of this study is to formulate thermal and environmental stable products and protect it from the metal surface oxidations factors. So, polycarbazole (PCz) was used because it produces environmentally balanced and thermally stable products compared to others. Polycarbazole can form a coherent film around the nanoparticles and prevent it from oxidation [13]. Polycarbazole also shows photorefractive properties. It also has non-linear optical properties which are useful in photoluminescence (PL) and surface plasmon resonance (SPR) [14]. The optical properties are used in electro-optic based switches, modulators, and frequency doublers [15]. However, to make a significant sensor with up to trace level detection capability for nitrogen, carbon dioxide and metal