The preparation of novel poly(ether-amide)s based on spiro[fluorene-9,9′-xanthene] and a polyamide/polymer-coated ZnO nanocomposite: thermal, optical, biological, and methylene blue dye adsorption attributes

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polymer chemistry

Abstract

Here, five novel polyamides containing ether linkages, xanthene, and fluorene rings have been successfully prepared ~~by~~ via one-step solution polymerization of a cardo-type diamine monomer based on xanthene and different commercial dicarboxylic acids. All ~~the~~ polymers ~~re~~presented good solubility in aprotic polar solvents and had inherent viscosity ~~is in~~within the range of 0.64-0.89 dL/g. The polyamides indicated good heat resistance with 10% weight loss temperatures ($T_{d10\%}$) ~~in the range of~~within 422-536 °C, ~~the~~ higher than 55% residues at 700 ~~°C~~°C, and high glass transition temperatures (T_g) of 208-281 ~~°~~°C in N_2 gas. ~~The~~ A remarkable anti-proliferative effect was exhibited toward the A431 cell line by pyridine-2,6-dicarboxylic acid-derived PA (IC_{50}= 18.7 µM, ~~Viability~~ viability inhibition= 94.49%). In addition, the facile synthetic route was used for the fabrication of a polymer nanocomposite with enhanced thermal and optical properties via grafting functionalized ZnO nanoparticles onto one of the polyamides. To ~~good~~ well disperse ZnO and increase interactions between two phases, the surface of nanoparticles was modified with ~~the help of the~~ silane coupling agent. The inhibition potency of PA-4 and (PA-4)-~~garfted~~grafted ZnO was checked against six bacteria species~~,~~. ~~it~~ It was found that composite (PA-4/ZnO@PMT) revealed better activities against the microorganisms. PA-4/ZnO@PMT with a cross-linked network structure and polyamides as absorbents were introduced for methylene blue dye (MB) removal from an aqueous solution. The prepared polymer nanocomposite ~~showed~~ indicated higher capability for extraction of MB dye ~~comparing~~ compared to polymer without filler.