PLANT OIL BASED NANOCOMPOSITE: PREPARATION, CHARACTERIZATION AND DEGRADATION BEHAVIOR

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ABSTRACT

Naturally occurring polymers such as starch, cellulose, chitosan, poly (lactic acid) and polymers from plant oils have long been used as biodegradable materials. However, as L. Averous and his co-workers mention in an excellent review, often such natural polymers are not fully competitive with conventional materials on performance level for particular applications. Thus, to further augment their applications, it is worthwhile to improve their mechanical strength, permeability, stiffness, crystallinity and thermal stability by the modification of natural polymers with nanoreinforcements forming organic-inorganic hybrids and composites therefrom with improved properties relative to the virgin polymer, also retaining their biodegradable behavior at the same time [1-3].

Plant oil polymers have found immense applications particularly as plasticisers, lubricants, biofuel, paints and coating materials. Besides this, although various biodegradable plant oil polymers, their hybrids and composite materials have been described [4, 5], what still remains problematic is to obtain their films, which are mechanically strong (contrary to generally obtained fragile films), biodegradable and non-toxic in nature.

In the present work, we have prepared plant oil based nanocomposite material [PON] with an inorganic precursor. The synthesized PON was characterized using FT-IR spectroscopy, thermo gravimetric analysis (TGA), differential scanning calorimetry (DSC), optical microscopy (OM), transmission electron microscopy (TEM) and scanning electron microscopy (SEM). Swelling behavior of PON in solutions with different pH values was also performed. The formation of PON was confirmed by FTIR spectra. The morphology (OM, TEM, SEM study) of PON revealed the presence of nanosized inorganic reinforcements in plant oil derivative matrix. PON showed good biodegradation behavior due to the presence of plant oil derivative. PON showed good thermal stability (TGA) attributed to the inorganic reinforcements embedded in the matrix.

It is envisaged that the said *PON hold future prospects for application as greener, environmentally benign, non-toxic, biodegradable nanocomposites with applications as drug carriers, packaging materials and others. PON are also foreseen as greener modifiers or "biodegradation inducers" when in combination with commercially available petro-based chemicals and non-biodegradable materials* to expedite the (after-service-life) degradation of the latter.

Acknowledgements:

Dr Eram Sharmin acknowledges the Dean, College of Pharmacy, Umm Al-Qura University and the Head, Department of Pharmaceutical Chemistry, College of Pharmacy, Umm Al-Qura University for the support provided. Dr Eram Sharmin acknowledges CSIR (New Delhi, India) for Senior Research Associateship against Grant No. 13(8464-A)/2011-Pool. Dr Fahmina Zafar is thankful to UGC (New Delhi, India) for Dr D S Kothari fellowship.

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