IJBPAS, March, 2025, 14(3): 1272-1278

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

RAPESEED OIL BASED-POLYURETHANE MULTIPLE WALL CARBON NANOTUBE (MWCNT) COMPOSITE FOR THE PURIFICATION OF BIODIESEL

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Received 4th Nov. 2023; Revised 5th Dec. 2023; Accepted 27th April 2024; Available online 1st March 2025

https://doi.org/10.31032/IJBPAS/2025/14.3.8578

ABSTRACT

The purpose of the current study is to examine the effects of greenpolyurethane Synthesize by Multiwall Carbon Nanotube band bio-based isocyanate are made of polyurethane/ multi wall carbon nanotube composite (MRPU/CNT). Fourier transform infrared spectroscopy (FTIR) has been determined that MRPU/MWCNT with of 3% MWCNT is the ideal composition for analysis to neat MRPU With the emergence of blisters and fissures on the exposed surface. For the purification of biodiesel, a multi-walled carbon nanotube-based polyurethane is used that is similar to petroleum derivatives

Keywords: Multiwall Carbon Nanotube, isocyanate, rapeseed oil, Fourier transform infrared spectroscopy (FTIR), biodiesel

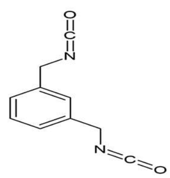
1. INTRODUCTION

The use of nanotechnology to all facts of society has been studied by scientists. The ability to regulate material properties by building such materials at the Nano scale is what makes nanotechnology so exciting. It'scalled ''nanotechnology''. The creation, processing, characterization, and use of materials, devices, and systems with dimensions on the order of 0.1-100 nm, is a broad definition of nanotechnology **[1-2]**. In the past decade or two, experimental techniques have been accessible that enable chemists to create nanomaterials in a controlled and repeatable manner. Technology applications in sensors and catalysis have recently drawn more attention to the exploitation of the tunable electronic characteristics of-nanoparticle structured materials Proteins, polysaccharides, and synthetic polymers are just a few examples of the materials that can be used to create nanoparticles **[3-5]**. multi-walled carbon nanotube (MWCNT) are the perfect reinforcing fibres for composites. Because of their high aspect ratio, outstanding mechanical strength, electrical and thermal conductivity, and thermal stability, With the extra capability of exceptionally high electrical and thermal conductivity, these materials can maintain the polymer matrix properties (elasticity, strength, and modulus) **[6-9]**. with the matrix brought on by their Nano-scale micro structure and incredibly huge interracial area, polyurethane/MWCNT composites have generated a lot of interest. Due to their special mechanical, surface, and multifunctional characteristics, as well as their strong interact Yet, doubts over what is feasible plague a large portion of the current work in polymer nanocomposites. Requiring a far more intricate structure Property investigations are in the process. More focus has been placed on the synthesis, morphological, chemistry, and mechanical qualities as a result of its distinctive properties. PU products are one of the most adaptable materials available today. Choosing the proper auxiliary compounds, catalysts, and raw materials **[10-14]**. MWCNT/polymer composites have a lot of promise for the creation of sophisticated composite materials of the utmost quality. According to reports, MWCNTs -based conducting materials typically have conductivity between 10^{-3} to 10^{3} S cm^{-1} Due to the unique combination of features they provide, conductive polymer composites (CPCs) with conductive fillers, notably carbon-based fillers, have drawn a lot of interest **[15-19]**. the most intriguing synthetic elastomer is polyurethane (PU). The reactions of isocyanate have a role in the chemistry of PU production. The form of (A-B) n represents the linear structure of segmented PU. The hard-segment part A is composed of alow-molecular weight diol or di-amine that has reacted with diisocyanate, and the soft-segment part B is typically polyester or poly ether macro logy with a molecular weight of 1000 to 3000. In order to make polyurethane, diisocyanate is used. Polyurethane has various qualities depending on the type of diisocyanate used.

2. MATERIALS AND METHOD:

2.1 Materials:

Using rapeseed oil for production of polyurethane. Also, for transformation of rapeseed oil through transesterification we use pentaerythritol purchased from TCI chemical. for polyurethane synthesis M-xylene Di isocyanate purchased from TCI chemicals. And 1,4 butane diol, Dibutyltin dilaurate, also purchased from TCI chemicals. DMSO purchased from Loba chemicals. Methanol, ethyl acetate and karanj oil purchased from SD FINE chemicals



M-xylene Di isocynate ($C_{10}H_8N_2O_2$)

2.2 Method:

2.2.1. Rapeseed oil transformation through transesterification

Rapeseed oil was changed utilizing a transesterification process with pentaerythritol at an ideal molar ratio of 0.2 in a three-necked round bottom flask with a stirrer and thermometer. [10]. the reaction took place at 210 °C with continuous stirring for 3 hours. [20] And was known as MRO [MRO~ MODIFIED RAPESEED OIL]

2.2.2Neatpolyurethane (MRPU) and polyurethane and MWCNT composite (MRPU/MWCNT) preparation.

The reactions were conducted in a round bottom flask with a magnetic stirrer and a thermometer at an optimum NRO: OH, molar ratio of 1.4:1[10, 21] the synthesis of pure polyurethane from MRO, m-Xylene Di isocyanate, and 1, 4 BD followed a clearly described procedure [10] and is shown as MRPU. Using MCO, Pols, 1, 4 BD, and 3 wt% MWCNT, an in-situ polymerization process was used to create the polyurethane/Nano silica composite. During two hours, ultra sonication was used to homogenies' MWCNT with the predicted amount of m-Xylene Di isocyanate.

The homogenized suspension of MXD+MWCNT was then continuously stirred with predetermined amount of moisture free MRO for 1–2 h using a mechanical stirrer at a reaction temperature of 70–80 °C. The reaction mixture was then supplemented BD while being vigorously stirred for an additional 30 minutes. Lastly, the Nano composite resin was allowed to degas entirely for 30 minutes in a prepared vacuum oven. The prepared sample's name is MRPU/MWCNT, and the numbers represent the weight percentage of MWCNT particles. The information on the synthesis of MRPU and its Nano composites is summarized in Table no.1.

[MRPU- Modified Rapeseed oil-based polyurethane]

[MXD-M-xylene Di isocyanate]

Table 1

Sample	MRO (ml)	MXD (ml)	1,4 BD (ml)	CNT (%)
MRPU/ CNT3%	5 ml	8.3 ml	2 ml	0.6 %

2.2.3 Preparation of Bio Diesel

Bio diesel was created from karanj oil using a 6:1 methanol to oil ratio and 15% (w/w) of H2SO4 at 60 °C after 24 hours. Ethyl acetate and water were used to eliminate glycerol and other contaminants. To get rid of the moisture, sodium sulphate was utilized. Activated charcoal was included to purge the mixture of any colour pollutants.

2.2.4 Application for biodiesel purification using Rapseed oil based polyurathane and MWCNT nano comosite

After elimination of impurities from biodiesel, and in round bottom conical flask take nearly 2% of polyurethane added to in biodiesel and put it on mechanical stirrer for 1h at room temp. Than filter it and weight the filtrate. Above procedure is also use in to prepare the biodiesel with rapeseed oil-based Nanocomposite. Now add 2.5 ml of methanol, 2.5 ml of solvent ether and 1 or 2 drops of phenolphthalein to neutralize the solution. Titrate with 0.1N KOH. End point is taken when the Mixture get pink colour for fifteen minutes. And calculate the purity of biodiesel.

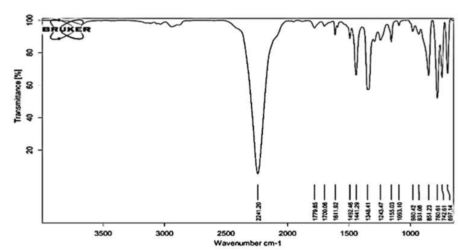
Table 2: Calculation value of biodiesel purification

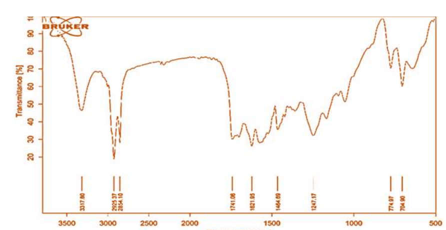
Acid value of blank biodiesel	Acid value of polyurethane	Acid value of MWCNT Nano composite	% of polyurethane	% of Nano composite
48.45	30.46	35.75	37.13 %	26.21%

3. RESULT AND DISCUSSION

3.1 FTIR of m-Xylene Diisocyanate

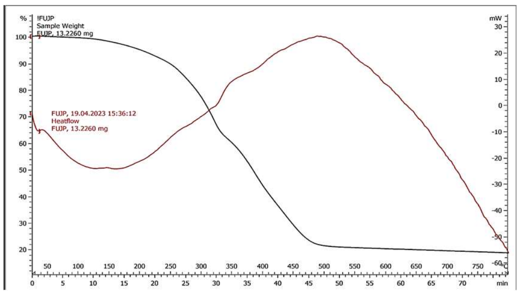
IR spectroscopy measures the amount of light an object absorbs in this region of the electromagnetic spectrum. A molecule's bond must be able to create a dipole moment, which shows that the electrons inside the bond are not distributed evenly, in order for the molecule to be able to absorb light. The functional groups of the components were divided based on their peak ratios following an FT-IR study on the skin toner extract. Major peak locations for the O-H, C-H, C-N, C-C, C-OH, and N-H groups were 2241, 1779, 1611,1611, 1093, and 697cm-1, respectively.





The below data shows the functional groups present in the MBPU/MWCNT3% The functional groups of the components were divided based on their peak ratios following an FT-IR study on the skin toner extract. Major peak locations for the N-H, O-H, C-H, C, C=O, C-H and Benzene groups were 2241, 1779, 1611,1611, 1093, and 697cm-1, respectively.

3.3 TGA Analysis of MBPU/MWCNT3%



In this graph mention the TGA analysis result for the specific sample weight (13.2260 mg) and the corresponding heat flow values observed during the analysis (70 mW, 100 mW,20 mW).

As per graph black line indicate the decomposition of MBPU/MWCNT3% in increase of temperature. Between 0-150 °C only 2% of loss observe and after 150 °C continues weight loss is observed .at 463 °C weight loss is about 25% and after wight loss is very low on increase of temperature

4. CONCLUSION

Hence, excellent findings are obtained from the synthesis and characterization of rapeseed oil based polyurethane multiwall carbon Nano tube composite for biodiesel purification. After being purified by rapeseed oil-based polyurethane and rapeseed oil-based polyurethane multi wall Nano tube composite, biodiesel has a purity of 37.13% & 26.21%, respectively. The purity of the biodiesel produced by the rapeseed oil-based polyurethane is higher than that of the rapeseed oil based multi wall Nano tube composite, which defies our expectations that they would be purer than rapeseed oil based the polyurethane.

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