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Synthesis and Characterization of New Poly Urethane

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ABSTRACT

A new poly ester-urethane –urea has been prepared, characterized and formulated into poly urethane methacrylate elastomer .This polymer was polymerized in a two step process:first synthesis of an isocynate terminated and second reaction of the product with tetramethylenediamine .Thermal analysis of this polymer was showed a good mechanical properties and behave like thermoplastic elastomers.

INTODUCTION

Poly urethane urea are composed of a class of elastomers exhibiting superior extensibility,and are extensively used in fields from textile to medical prosthesis [1,2].A large variety of properties depending on the frequency of the arrangement of acrylic structural units on the macromolecular chain,is obtained such as: anticorrosive protective films and finish materials for the leather industry[3,4],bending matter for magnetic media [5,6],mounts for printing ink[7],coating for optical fibers[8-10],carbon fibers[11],adhesives [12],gas and liquid separating membranes [13],materials for medical usage[14].Recently ,polyurethaneacrylate elastomer with biomedical and enzyme immobilization properties[15,16] have been synthesized in aqueous medium, by unconventional methods. On the other hand ,the relatively easy polymerization of liquid acrylic polyurethane oligomers, by UV light or electron beam[17] which con serve the crystallinity of polyestric cahains [18],represents another convincing proof of their technical and scientific interest.

Experimental:

1-Material

4,4-diphenylmethane diisocyanate(MDI),1,4-tetramethylene diamine and sodium acrylate from Merck. Dimethylformamide from Fluka.

2-Measurements

The infrared spectra were run on a Specord M80 Carl Zeiss Jena spectrometer using the KBr pellet tech-nique. Thermogravimetric analyses were performed on a derivatograf MOM apparatus (Germany).

3- Synthesis:

The poly urethane –urea-acrylate was synthesized in a multi-step reaction as shown in Scheme 1.the pre-polymer diisocyanate was synthesized in a three-necked round bottomed flask equipped with

amechanical stirrer. Typically ,20g(0.01 mol)of poly ester diol was put into flask and melted in an oil bath at 120C.Then5g(0.02mol)of 4,4-diphenylmethane diisicyanate was added in the temperature 80C for 1 h. Then 1.8g(0.02mol)sodium acrylate was added and stirred for 30 min. The reaction was carried out in dimethylformamide.

Results and discussion:

1-IR study

The infrared(IR) specterometer was examined in the NH and C=O absorption regions.Three regions are of interest :the –NH stretch absorptions(3500-3200cm),the CH_2stretch absorptions (3000-2700cm)and the carbonyl vibrations(1750-1650cm).

2-Thermogravimetric studies:

The thermograms analysis curves showing the activation energy as a function of conversion for the polymer(Fig.3).These curves show a decrease in the activation energy ,up to a 10-15% conversion, followed by an increase up to 70-80%conversion ,and then a new decrease. The decreasing may be due to dehydration or double bond polymerization.

Conclusion:

The new thermal polyurethane polymer have been synthesized and characterized. Analysis of the thermograms leads to the curves which evidence a decrease of the activation energy up to a 10-15% conversion, followed by an increase. The thermograms was indicate that the polymer has good mechanical properties.

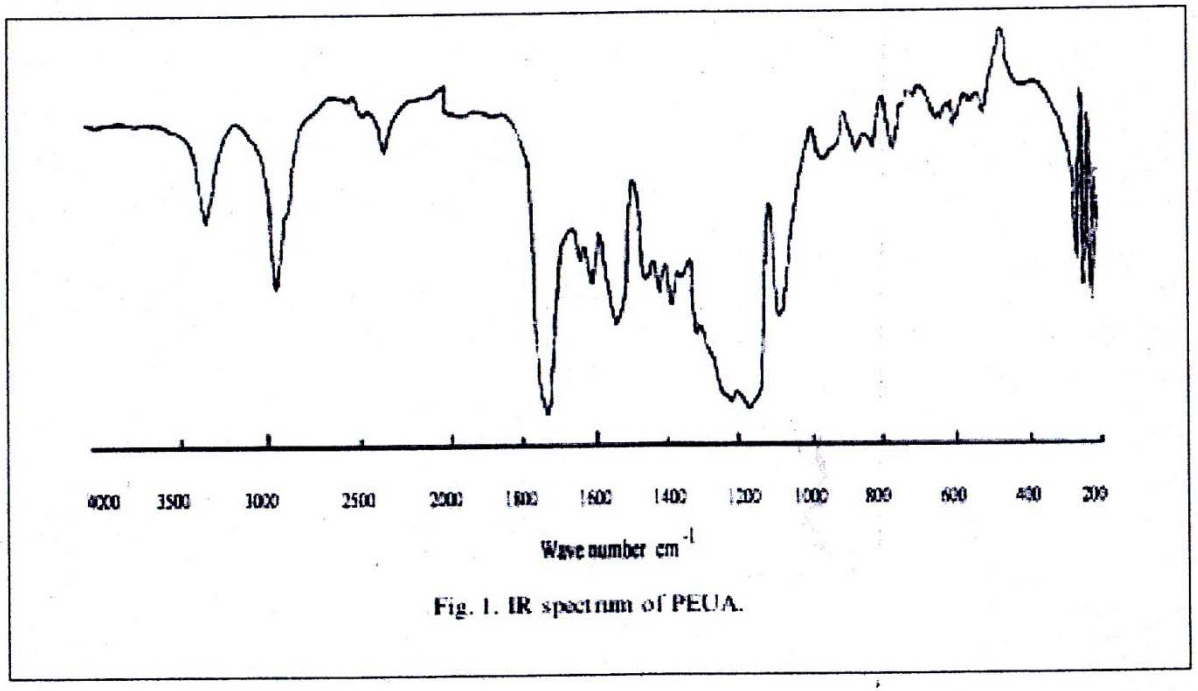

Fig. 1. IR spectrum of PEUA.

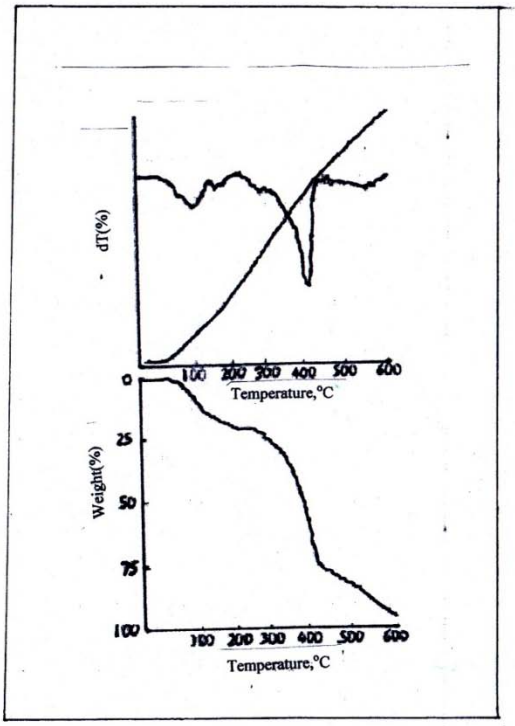

Fig.3. Characterization of polyurethane methacrylate decomposition by TGA for PEUA.

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