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A NOVEL POLYURETHANE: PREPARATION, CHARACTERIZATION

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Abstract: The preparation and characterization of the polyurethane obtained by the reaction of diol phenolphthalein with diisocyanate. The polyurethanes were characterized by Fourier transform infrared spectroscopy, X-ray diffraction and thermogravimetric analysis.

Keywords: Polyurethane.

1. INTRODUCTION

Polyurethanes are valuable compounds due to their unique properties have key role in different areas. It was widely used in coatings, adhesives, thermoplastic elastomers and composite. Polyurethanes are multiple block copolymer composed of alternating hard and soft segments, which, due to the incompatibility of two dissimilar segment, form a two-phase microstructure [۱]. The soft segments are generally polyethers or polyesters with the glass transition temperature (T_g) in the range of -70 to -30 °C and the hard segments are formed from the extension of a diisocyanate with a low molecular weight diol having a high T_g [2]. In polyurethanes, the hard domain serves as physical crosslinks or filler patrticles and also as reinforcement to the soft segment matrix [3]. Polyurethanes are functional polymers whose properties can be tailor-made by simply adjusting the compositions to meet the highly diversified demands of modern technology [4].

2. EXPERIMENTAL

2.1. Materials

All chemicals were purchased from Fluka Chemical Co. (Buchs, Switzerland), Aldrich Chemical Co. (Milwaukee, WI), Riedel-deHaen AG (Seelze, Germany) and Merck Chemical Co. N,N-Dimethylformamide (DMF, Merck), 4,4-diphenylmethane (MDI, Aldrich), phenolphthalein (PHP, Merck), and1,4-butanediol (1,4-BG, Fluka) were used as received.

2.2. Techniques

FT-IR spectra were recorded with a Jasco-680 spectrometer (Japan) in the range of 400–4000 cm−1. Vibration bands were reported as wavenumber (cm−1). FT-IR spectra of all samples were collected by making their pellets in KBr as a medium. The diffraction pattern of related materials was recorded in the reflection mode using a Bruker, D8 Advance diffractometer. Nickel filtered CuK radiation (radiation wavelength, λ = 0.154 nm) was produced at an operating voltage of 45 kV and a current of 100 mA. Thermogravimetric analysis (TGA) was performed with a STA503 win TA at a heating rate of 10 °C /min from 25 °C to 800 °C under nitrogen atmosphere.

2.3. Polymer synthesis

MDI (0.5 g, 2.87 × 10^{-3}mol) and PHP (0.5172 g, 1.43 × 10^{-3} mol) at a molar ratio of 2:1 were dissolved in DMF solvent and then heated to 90°C with stirring under nitrogen atmosphere for 5 h to form prepolymer. 1,4-BG (0.1294 g, 1.43 × 10^{-3}mol) was added to the prepolymer with stirring at room temperature for 5 h to complete the reaction. The PU film was