

PREPARATION OF SULFONATED POLYSTYRENE BLENDED POLYSTYRENE FILM AND ITS WATER ABSORPTION PROPERTY UNDER DIFFERENT pH ENVIRONMENTS

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Polystyrene (PS) is one of the most widely used plastics. The hydrophobic nature of the PS film restricts its application in several fields. In this work, PS films were prepared with different formulations and their water absorption properties in acidic, alkaline, and neutral environments were studied. The sulfonated polystyrene (S-PS) was prepared by homogeneous sulfonation using acetyl sulfate as a sulfonating agent. S-PS was characterized using FTIR. The degree of sulfonation was 10 based on the calculation using NaOH titration. The films were made by independently mixing S-PS at mass ratios of 0, 5 and 10% with PS. The films were prepared by solvent-casting method. The mass percentage of the polymer in the solvent (ethyl acetate 80% + chloroform 20%) was 20, and the same method was adopted to prepare the films with a plasticizer (diethyl phthalate). The viscosity of the polymer solution was measured with Brookfield digital viscometer. The addition of S-PS and plasticizer change the viscosity. The average thickness of the films was 0.33 mm. A water droplet on the film's surface was captured using a digital camera with a macro lens. The contact angle was measured using the image-processing program Image j. The contact angle for the pure polystyrene film was increased by the addition of a plasticizer. However, the contact angle decreased with the addition of a plasticizer for the film blended with a higher percentage of sulfonated polystyrene. The water absorption test was performed according to ASTM D570. From each film, 30 · 25 mm² specimens were cut, and samples were dried in an oven for 24 h at 50 °C. It was promptly weighed after cooling in a desiccator. The samples were then submerged individually in distilled water (pH 7), acidic water (pH 2), and basic water (pH 12), and the water absorption characteristics of the films were determined by weighing the specimens every two days. The overall analysis shows that the mass of S-PS in the film and the addition of plasticizer have an impact on the water absorption capacity of the film. The plasticizer increases the hydrophobic nature of the pure polystyrene film. However, the addition of plasticizer increased the hydrophilic nature of the film blended with S-PS. The film blended with S-PS at a higher ratio exhibits higher water absorption capacity in acidic and neutral environments than in the alkaline environment.

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