일반강연 A-13

에스테르기를 도입한 술폰화 프탈계 폴리이미드와 나프탈렌계 폴리이미드의 수화안정성에 관한 연구

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Hydrolysis Stability of Sulfonated Phthalic and Naphthalenic Polyimide with Ester Bond

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Sulfonated polyimides had been increasingly used and studied widely as high performance available materials because of their specific properties such as excellent thermal stability, good chemical stability, mechanical strength and so on. In fact, it has been reported that sulfonated polyimide membranes can be used in ionic separation by electrodialysis owing to their H^+/M^{z+} selectivity and can also hold carrier counter-ions able to facilitate specifically the transport of a gas in a separation process. Also, sulfonated polyimides were also evaluated as good material in chloro-alkali electrolysis and cationic exchange resins. In addition to these applications, sulfonated polyimides have developed for recent years with the objective of producing high-performance, long durability and low-cost proton conducting electrolyte membranes for proton exchange membrane fuel cell (PEMFC) technology.

However, a slow decrease in performance depending on polyimide ring structure during applications had been reported, which could be attributed to a loss of ionic conductivity related to either a continuous dehydration or polymer degradation. One of main reasons to account for degradation of sulfonated polymers is the hydrolysis leading to polymer chain scission and decrement of molecular weight. Therefore, the aim of our study was to investigate possible imide cycle and additional ester bond cleavage connected with SO_3H presence under water medium. In order to confirm and observe as clear information as possible about breakages of bonds from ^{1}H and ^{13}C NMR and IR spectroscopic analyses, our study was performed and observed by model compound. Consequently, model compounds with both phthalic and naphthalenic imide rings and ester bonds were synthesized to evaluate the hydrolysis stability of sulfonated polyimide. The experiments were performed for prepared model compounds before and after aging in deionized water at 80℃ and were terminated by for lyophilization technique. The aging products were finally analyzed by NMR and IR spectroscopy.

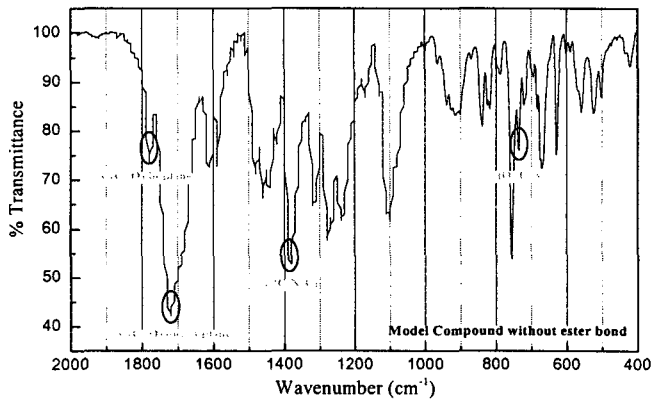

Fig 1. FT-IR spectrum of model compound B without ester bond

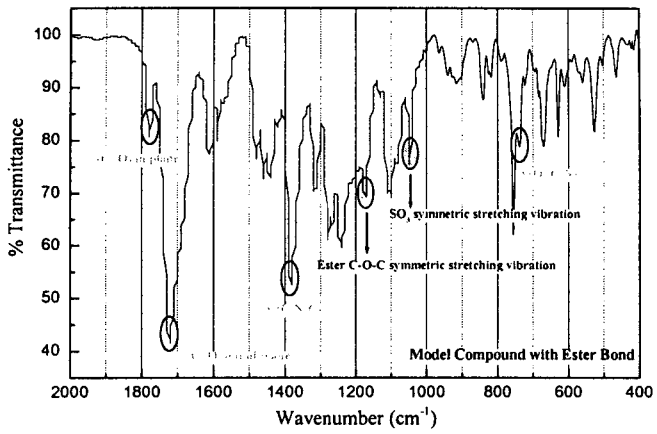

Fig 2. FT-IR spectrum of model compound D with ester bond

Reference

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