Studi eksperimental pengaruh doping variasi senyawa garam terhadap konduktivitas polimer polianilin pani = Study experimental effects of doping for varying compound salt on electrical conductivity of polymers polyaniline pani

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Abstrak

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Telah dilakukan sintesis polimer konduktif melalui proses rekayasa polimerisasi anilin menjadi Polyaniline Emeraldine Salt (PANi-ES). Penetralan sifat PANi diperoleh setelah proses pencucian sehingga berubah menjadi Polyaniline Emeraldine Base (PANi-EB). Tahapan ini dilanjutkan dengan tahapan pengkayaan muatan listrik melalui proses protonasi beberapa jenis garam (KSO4, KCl, K2CO3 dan NaSO4) dalam kurun waktu 10 jam untuk menjadi PANi conductive. Proses polimerisasi dimulai setelah pencampuran antara larutan HCl mengandung anilin dan larutan HCl mengandung Ammonium Persulphate (APS). Berlangsungnya proses polimerisasi disertai dengan peningkatan temperatur, kekentalan, ukuran partikel serta perubahan warna larutan. Hasil karakterisasi terhadap larutan selama berlangsungnya proses polimerisasi menunjukkan bahwa kekentalan larutan meningkat dari 426 mPa.s menjadi 1315 mPa.s; ukuran partikel rata-rata naik dari 6 m menjadi 33 m. Peningkatan nilai kekentalan dan ukuran rata-rata partikel terkait dengan pembentukan dan pertumbuhan rantai polimer pada tahapan inisiasi dan propogasi. Proses polimerisasi berhenti ketika tidak lagi terjadi perubahan indicator laruran. Pengkayaan muatan melalui pemberian larutan garam telah meningkatkan nilai konduktivitas listrik PANi. Namun nilai konduktivitas PANi terbesar hanya diperoleh dari protonasi garam KCl sebesar 2,12 x 10-4 S/cm. Hasil karakterisasi PANi dengan FTIR memastikan bahwa pola serapan IR yang diperoleh adalah pola serapan PANi dan protonasi dengan garam tidak mempengaruhi pola serapan IR. Lalu, hasil karakterisasi dengan menggunakan Xray difraksi menunjukan persebaran atom yang tidak teratur atau amorf pada sekitar 2Ɵ = 25°. Disimpulkan bahwa, sintesis PANi conductive melalui proses polimerisasi dan pengkayaan muatan dengan larutan garam telah tercapai dengan baik.
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ABSTRAK
Conductive polymer has successfully been synthesized through the engineering process of polymerization of aniline containing solution toward the Polyaniline Emeraldine Salt (PANi-ES) as the intermediate product. Deprotonation of PANiES was carried out through a cleaning treatment of PANi-ES by washing. To this stage the PANi-ES changed to the Polyaniline Emeraldine Base (PANi-EB). The stage of enrichment of PANi by electric charges was conducted through protonation process using some types of salt (K2SO4, KCl, K2CO3 and NaSO4) within 10 hours duration time of polimerization. The polymerization process begins after the mixing between the HCl solution containing aniline and HCl solution containing Ammonium Persulphate (APS). The course of the polymerization process was accompanied by an increase in temperature, viscosity, particle size and the color changes of the solution. Results of the characterization of the solution during the polymerization process showed that the viscosity of the solution increased from 426 mPa.s to 1315 mPa.s; The mean particle size increased from 6 m to 33 m. The increased

in viscosity values and mean particle sizes associated with the formation and growth of the polymer chains during initiation and propogation process. The polymerization process stopped when there have bee no longer indicators change in the solution. Enrichment of electrical charges through the protonation by salt solution has improved the electrical conductivity values of the PANi. But the largest conductivity value of 2.12 x 10-4 S/cm for the PANi was obtained only from protonated by KCl. The characterization of enriched PANi as the final product with FTIR ensure that the IR absorption pattern is the typical that of PANi. Protonated with salt to the PANi does not affect the pattern of IR absorption. Then, The X-ray diffracton pattern indicates that the chains are strong disordered. The doped PANi shows a broad amorphous scattering aroung 2Ɵ = 25°. It is concluded that, the synthesis of conductive PANi through polymerization and electrical charge enrichment with salt solution has been successfully reached.