Sintesis dan karakterisasi polianilin dengan variasi doping asam kuat = Synthesis and characterization of polyaniline by strong doping acid variations

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Abstrak

ABSTRAK
Polianilin PANI telah disintesis melalui metode polimerisasi oksidatif Anilin secara kimiawi dengan Ammonium Peroksidisulfat APS sebagai inisiator. Dilakukan dengan sistem penetesan, dijaga laju tetes dan diberi pengadukan stirer selama 8 jam pada suhu ruang 28?C . Kemudian hasil polimerisasi berupa Polianilin garam emeraldin PANI-ES diberi perlakukan dedoping, sehingga menjadi Polianilin basa emeraldin PANI-EB . Setelah itu, PANI-EB diberi perlakukan doping protonasi dengan asam protonik CHOOH, HNO3 HCl, HClO4 dengan metode pengadukan selama 10 jam pada suhu ruang. Setiap protonasi menggunakan skala 1:10 untuk PANI-EB dan dopan asam protonic di dalam reaktor. Kemudian, sempurnanya proses polimerisasi ditandai dengan meningkatnya ukuran partikel hingga 54.716 m pada menit ke-270, tercapainya viskositas hingga 1.87 mPa pada waktu yang sama dan perubahan suhu terjadi selama proses polimerisasi. Indicator tersebut untuk menunjukkan progress perpanjangan rantai molukel polimer. Kehadiran Polianilin dikonfirmasi dengan pengujian FTIR pada masing-masing spectrum, yaitu reaksi sempurna ketika ikatan rangkap pada spektrum 3442 cm-1 hilang dan muncul molekul baru benzenoid dan quinoid pada spectrum 1300-1600 cm-1 memastikan semua molekul anilin telah berubah menjadi PANI tanpa residu didalamnya. Hal tersebut mengkonfirmasi bahwa PANI telah sukses disintesis dengan proses polimerisasi oksidatif. Sementara itu, nilai konduktivitas PANI diberikan dari asam protonic. Nilai konduktivitas PANI meningkat dengan penambahan dopan asam protock, berupa asam kuat, seperti asam Formik HCOOH , asam Nitrat HNO3 , asam Klorida HCl and asam Perklorat HClO4 , dimana nilai konduktivitas didapat berturut-turut 0.1023, 0.1220 , 291.7690 and 13496.5003 S/cm dengan diukur menggunakan LCR Meter pada arur DC. Nilai tersebut meningkat dari sebelumnya, dimana tidak ada dopan yang digunakan, menghasilkan nilai konduktivitas 0.00099 S/cm untuk PANI-EB and 4479.9371 S/cm untuk PANI ES. Maka didapat PANI-HClO4 memiliki konduktivitas terbaik. Kemudian untuk yang memiliki kemampuan serapan gelombang mikro terbaik adalah PANI-EB dengan -29.69 dB pada frekuensi 11.812 GHz, sedangkan HClO4 memiliki kemampuan serapan terburuk yaitu -2.74 dB pada frekuensi 12.400 GHz.
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ABSTRACT
Polyaniline PANI has been synthesized through chemical oxidative polymerization of aniline monomer with ammonium persulphate APS as an initiator. It is prepared by keeping flow rate and stirring during 8 hours at room temperature 28 C . The first result will be obtained Polyaniline emeraldin salt PANI ES then changing to form Polyanline emeraldin base PANI EB . The stable PANI EB was doped by additional of protonic acid CHOOH, HNO3 HCl, HClO4 respectively at room temperature then keep mixing for 10 hours. The ratio was used 1 10 for each additional of protonic acid. The maximum value was obtained from this reaction of polymerization process was indicated by increasing particle size up to 54.716 m, Viscosity value reaching

1.87 mPa. s and the highest temperature was observed during the polymerization process was 33 C at 270 minutes. All those indicators indicated that there is propagation process of polymer molecule chains. The present of molecule PANI was then confirmed by their respective FTIR spectrum, i.e. the complete reaction when the double bond at 3442 cm 1 was disappearing on the spectrum using FTIR Spectrophotometer, a new species of benzoic and quinoid molecule at 1300 1600 cm 1 to ensure that all aniline molecules had been converted to be PANI with no residual inside. It is concluded that PANI has successfully synthesized through the oxidative polymerization process. The electrical conductivity value of PANI is driven by protonic acids. The conductivity value increased with the addition of protonic acids as strong acid doping agent, i.e. Formic acid HCOOH , Nitric acid HNO3 , Hydrochloric acid HCl and Perchloric acid HClO4 , whereby the conductivity level obtained were 0.1023, 0.1220 , 291.7690 and 13496.5003 S cm respectively was measured by LCR Meter at DC current. Those values are an increase from the previously obtained where no dopant was used resulting in conductivity levels of 0.00099 S cm for PANI EB and 4479.9371 S cm for PANI ES. Thus, PANI HClO4 is the best in term of the conductivity value. The best material candidate for microwave absorbing material is PANI EB, which has the highest reflection loss value of 29.69 dB at a frequency of 11.812 GHz, whereas PANI HClO4 only have 2.74 dB at a frequency of 12.400 GHz.