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Pengaruh konsentrasi asam perklorat terhadap sifat dielektrik polianilin = Effect of perchloric acid concentration to dielectric properties of polyaniline

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Abstrak

Telah dilakukan penelitian dengan tujuan untuk mengetahui pengaruh konsentrasi doping Asam Perklorat terhadap sifat dielektrik Polianilin. Sintesis PANi konduktif dilakukan melalui serangkaian proses terdiri dari reaksi oksidatif kimiawi untuk melangsungkan proses polimerisasi selama 8 jam dengan hasil berupa PANi Emeraldin (PANi-ES). Tahapan proses sintesis PANi-ES ini diikuti dengan tahapan deprotonisasi untuk membentuk PANi basa atau PANi emeraldin-base (PANi-EB). Tahapan sintesis akhir adalah berupa tahapan untuk menimbulkan sifat konduktifitas listrik PANi melalui doping asam kuat perklorat (HClO4) dengan cara mencampurkan PANi-EB sebanyak 8 gram kedalam larutan asam perklorat dengan variasi fraksi volume 80-200 ml/l. Proses pengeringan PANi melaui metode pengeringan vakum mengambil waktu 1 minggu. Selama proses polimerisasi berlangsung dilakukan pengukuran temperatur larutan, perubahan pH dan viskositas serta ukuran rata-rata partikel PANi. Sampel yang terbuat dari PANi hasil sintesis tersebut kemudian dikarakterisasi dengan spektrofotometer FTIR (Fourier Transform Infrared Spectroscopy), LCR (Inductance (L), Capacitance (C), Resistance (R)) meter , PSA (Particle Size Analyzer), dan VNA (Vector Network Analyzer) untuk mengetahui gugus fungsi, konduktivitas, ukuran partikel, dan daya serap gelombang mikro dengan rentang frekuensi tertentu (8-12 GHz). Hasil karakterisasi berdasarkan penelitian menunjukkan bahwa Polianilin (PANi) yang telah terdoping asam protonik (terprotonasi) telah menjadi polimer konduktif dan memiliki karakteristik puncak pita serapan IR pada bilangan gelombang antara 1325 cm-1 sampai 1575 cm-1. Ukuran partikel rata-rata Polianilin hasil sintesis adalah 20,7-36,24 mikrometer. Polianilin yang memiliki konduktivitas listrik tertinggi yaitu Polianilin dengan doping asam protonik HClO4 yang konsentrasinya 200 mL/L sebesar 5,2 mS/cm dan memiliki daya serapan gelombang mikro -3,45 dB pada frekuensi 10,44 GHz.

.....Results of a study which aimed at to determine the effect of concentration of Perchloric Acid to the dielectric properties of Polyaniline are reported. In this study, conductive PANi was synthesized through a series of chemical oxidative reactions to carry out the polymerization process for 8 hours, which resulted in a PANi Emeraldin (PANi-ES). The synthesize processes of PANi-ES were followed by de-protonisation stage to form emeraldin-base PANi (PANi-EB). The final stage of conductive PANi was a protonisation stage to generate the electrical conductivity in synthesized PANi. This physical property was obtained through doping treatment by mixing between PANi-EB of 8 grams in mass and Perchloric Acid solution of 80-200 ml/l volume fractions. The drying process of conductive PANi was carried out through a vacuum drying method which required at least 1 week duration. During the polymerization process taking place, the temperature, a change in pH and viscosity as well as the mean size of the particles of solution were evaluated. The synthesized PANi were characterized by FTIR (Fourier Transform Infrared Spectroscopy), LCR (Inductance (L), Capacitance (C), Resistance (R)) meter, PSA (Particle Size Analyzer), and VNA (Vector Network Analyzer) to determine the functional groups, electrical conductivity, mean particle size, and the absorption of microwaves in the specific frequency range (8-12 GHz). According to the test results,

it is shown that Polyaniline (PANi) doped by protonic acid (protonated) became a conductive polymer characterized by infra-red absorption peaks at wave numbers between 1325 cm-1 and 1575 cm-1. The mean particle size of changed from each starting from 20.7 to 36.24 micrometers during polymerization. PANi which has the highest electrical conductivity (5.2 mS/cm) was obtained in polyaniline which doped by HClO4 of 200 ml/L volume fraction. It has a reflection loss value of -3,45 dB at the frequency 10,44 GHz.