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KARAKTERISASI STRUKTUR NANO KARBON DARI LIGNOSELLULOSA

(Characterization on the Structures of Ligno-cellulose Nano Carbon)

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ABSTRACT

The science advance mentin this century is such that in the future it will enter the nano technology. More specifically in the forest products field, the nano technology that can be developed is among others nano carbon derived from lignocelulosic stuffs. In relevant, this research aims to provide information and technology on the charcoal processing from lignocellulosic stuffs into nano carbon.

The lignocellulosic stuffs used in this research consisted of teak wood and bamboo, further carbonized into charcoal at 400-500°C using drum kiln. The resulting charcoal was examined of its physical and chemical properties, crystalinity degree and dielectric characteristics, and then purified by re-carbonizing it at 800°C for 60 minutes. Prior to the purification, the charcoal sustained the doping (intercalation) process with Zn, Niand Cumetal seach respectively. After the purification, the charcoal was ground to very tiny particels using HEM (high energy machine) device for 48 hours. In this way, the charcoal with high crystalinity was yielded, and further sinte redusing spark plasma at 1, 300 Cinto the nano carbon. The qualities and structure of all the resulting carbon (carbonized charcoal, re-carbonized charcoal, intercalated charcoal and sintered nano carbon) were evaluated using nano scale device (Py-GCMS, SEM-EDX and XRD), and examined as well of their dielectric characteristics.

In turns out that the best quality charcoal was obtained from teak wood charcoal carbonized at 800°C, intercalated with Ni atoms at the ratio 1:5. The resulting charcoal afforded high crystalinity (78.98%), ow electric resistance (0.17 Ω), and high conductivity 175.52 $\Omega^{-1}m^{-1}$ Qualities of the corresponding nano (after sintering) were such that its crystalinity spectaculary reached 81.87%, resistance (R) 0.01 Ω withvery high conductivity 1067.26 $\Omega^{-1}m^{-1}$. The nano carbon that resulted seems favorably prospective for bio-censor, bio-battery, and bio-electrode. Accordingly futher related research deserves carrying out.

Keywords: Carbon, spark plasma sintering, intercalation, ligno-cellulosic stuffs

ABSTRAK

Perkembangan ilmu pengetahuan abad ini dan yang akan datang sudah memasuki teknologi nano. Di bidang hasil hutan, teknologi nano yang dapat dikembangkan di antaranya adalah nano karbon dari bahan berlignoselulosa. Tujuan penelitian ini adalah menyediakan informasi dan teknologi pengolahan arang sebagai bahan baku nano karbon dari bahan lignoselulosa.

Bahan baku lignoselulosa yang digunakan dalam penelitian ini adalah kayu jati, dan bambu yang dikarbonisasi pada suhu 400-500° C menggunakan kilndrum, arang yang dihasilkan dimurnikan dengan jalan dipanaskan pada suhu 800° C selama 60 menit yang sebelumnya didoping dengan logam Zn, Ni dan Cu. selanjutnya dihaluskan menggunakan *high energy mechanic* (HEM) selama 48 jam. Arang dengan kristalinitas tinggi disintering menggunakan spark plasma pada suhu 1.300^{o} C. Karbon yang dihasilkan di uji sktuktur dan sifatnya menggunakan Py-GCMS, SEM-EDX, XRD, dan sifat elektrik.

Hasil penelitian menunjukkan struktur karbon yang terbaik dihasilkan dari arang jati yang dikarbonisasi pada suhu 800° C yang didoping dengan atom Ni pada perbandingan 1:5 yang menghasilkan derajat kristalinitas sebesar 78,98% resistensi (R) 0,17Ω, konduktivitas 175,52 $\Omega^{-1}m^{-1}$. Kualitas nano karbon setelah disintering derajat kristalinitasnya menjadi 81,87%, resistensi (R) 0,01Ω, dan konduktivitasnya sebesar 1067,26 $\Omega^{-1}m^{-1}$. Nano karbon yang dihasilkan dapat dibuat sebagai biosensor, biobatere dan bioelektroda. Sehingga diperlukan penelitian lebih lanjut.

Kata kunci: Karbon, spark plasma sintering, lignoselulosa