ABSTRAK

PENGARUH AKTIVASI KARBON ARANG TEMPURUNG KELAPA TERHADAP HASIL PROSES *PACK CARBURIZING* PADA BAJA AISI 1020 DENGAN PERLAKUAN *QUENCHING*

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Baja AISI 1020 merupakan baja karbon rendah yang banyak digunakan karena keuletan dan kemudahan fabrikasinya, namun memiliki kekerasan permukaan yang rendah sehingga memerlukan perlakuan permukaan. Penelitian ini bertujuan menganalisis pengaruh aktivasi karbon arang tempurung kelapa pada proses *pack carburizing* terhadap perubahan komposisi kimia, kekerasan, dan struktur mikro baja AISI 1020 dengan perlakuan *quenching* dan tanpa *quenching*. Proses *pack carburizing* dilakukan pada suhu 850°C dengan waktu penahanan 2 jam menggunakan arang tempurung kelapa non aktif dan arang aktif. Setelah proses *carburizing*, spesimen didinginkan dengan pendinginan udara dan *quenching* air. Pengujian meliputi uji komposisi kimia menggunakan *Optical Emission Spectroscopy* (OES), uji kekerasan *Micro Vickers*, serta pengamatan struktur mikro menggunakan mikroskop optik. Hasil uji komposisi kimia menunjukkan bahwa kadar karbon baja meningkat dari 0,20% pada *raw* material menjadi 0,51% pada penggunaan arang non aktif dan 1,08% pada penggunaan arang aktif. Hasil uji kekerasan menunjukkan nilai rata-rata sebesar 176,4 HVN pada *raw* material, meningkat menjadi 294,6 HVN pada arang non aktif tanpa *quenching*, 309,6 HVN pada arang aktif tanpa *quenching*, 882 HVN pada arang non aktif dengan *quenching*, dan mencapai nilai tertinggi 927,2 HVN pada arang aktif dengan *quenching*. Pengamatan struktur mikro menunjukkan dominasi *ferrite* dan *pearlite* pada *raw* material dan spesimen tanpa *quenching*, sedangkan spesimen dengan *quenching* menunjukkan terbentuknya *martensite* yang berkontribusi terhadap peningkatan kekerasan permukaan.

Kata Kunci**:** Baja AISI 1020; *Pack Carburizing*; Karbon Aktif; Arang Tempurung Kelapa; Komposisi Kimia; Kekerasan *Micro Vickers*; Struktur Mikro; *Quenching*.

ABSTRACT

THE EFFECT OF COCONUT SHELL CHARCOAL ACTIVATION ON THE RESULTS OF THE PACK CARBURIZING PROCESS ON AISI 1020 STEEL WITH QUENCHING TREATMENT

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AISI 1020 steel is a low-carbon steel widely used due to its good ductility and ease of fabrication; however, it has relatively low surface hardness, which necessitates surface treatment. This study aims to analyze the effect of activated coconut shell charcoal in the pack carburizing process on changes in chemical composition, hardness, and microstructure of AISI 1020 steel with quenching and non-quenching treatments. The pack carburizing process was conducted at a temperature of 850°C with a holding time of 2 hours using non-activated and activated coconut shell charcoal. After the carburizing process, the specimens were cooled by air cooling and water quenching. The tests carried out included chemical composition analysis using Optical Emission Spectroscopy (OES), hardness testing using the Micro Vickers method, and microstructural observation using an optical microscope. The chemical composition test results showed that the carbon content increased from 0.20% in the raw material to 0.51% when non-activated charcoal was used and to 1.08% when activated charcoal was applied. The hardness test results indicated an average hardness value of 176.4 HVN for the raw material, which increased to 294.6 HVN for non-activated charcoal without quenching, 309.6 HVN for activated charcoal without quenching, 882 HVN for non-activated charcoal with quenching, and reached the highest value of 927.2 HVN for activated charcoal with quenching. Microstructural observations revealed that the raw material and non-quenched specimens were dominated by ferrite and pearlite phases, whereas the quenched specimens exhibited the formation of martensite, which contributed significantly to the increase in surface hardness.

Keywords: AISI 1020 Steel; Pack Carburizing; Activated Carbon; Coconut Shell Charcoal; Chemical Composition; Micro Vickers Hardness; Microstructure; Quenching.