

ABSTRAK

Baja AISI 1020 merupakan baja karbon rendah yang banyak digunakan industri pada komponen permesinan karena memiliki keuletan dan kemudahan proses manufaktur. Namun, baja ini memiliki kekerasan permukaan dan ketahanan aus yang relatif rendah sehingga perlu ditingkatkan kekerasannya. Salah satu metode yang dapat digunakan adalah *pack carburizing*. Penelitian ini bertujuan untuk mengetahui pengaruh variasi komposisi karbon (C) dari arang kayu jati dan katalisator kalsium karbonat (CaCO_3) dari cangkang keong mas terhadap nilai kekerasan Vickers dan struktur mikro baja AISI 1020.

Penelitian dilakukan menggunakan sepuluh spesimen baja AISI 1020 yang terlebih dahulu diberi perlakuan *normalizing* temperatur 915°C selama 60 menit. Untuk delapan spesimen setelah proses *normalizing* dilakukan *pack carburizing* pada temperatur 950°C dengan *holding time* 60 menit menggunakan empat variasi komposisi media dengan masing-masing variasi memiliki dua spesimen pengujian. Variasi komposisi yang digunakan adalah 100% C, 90% C : 10% CaCO_3 , 70% C : 30% CaCO_3 , dan 50% C : 50% CaCO_3 . Setelah spesimen melewati perlakuan *pack carburizing*, dilanjutkan perlakuan *quenching* dengan media air. Pengujian yang dilakukan adalah kekerasan Vickers dan pengamatan struktur mikro menggunakan mikroskop metalografi pada dua spesimen perlakuan *normalizing* dan delapan spesimen perlakuan *normalizing*, *pack carburizing* dengan *quenching*.

Hasil penelitian menunjukkan bahwa variasi komposisi media *pack carburizing* memberikan pengaruh yang signifikan terhadap peningkatan kekerasan dan perubahan struktur mikro baja AISI 1020. Spesimen *normalizing* memiliki nilai kekerasan rata-rata sebesar 123,48 HV dan 121,86 HV. Setelah perlakuan *pack carburizing* mendapatkan hasil kekerasan pada variasi 90% C : 10% CaCO_3 sebesar 789,90 HV dan 768,66 HV, variasi 100% C sebesar 684,30 HV dan 588,04 HV variasi 70% C : 30% CaCO_3 dan variasi 50% C : 50% CaCO_3 . Variasi 90% C : 10% CaCO_3 menghasilkan struktur *martensite* paling dominan dengan nilai kekerasan tertinggi dan kedalaman difusi karbon terbesar yaitu 710 μm dan 678 μm .

Kata kunci: Baja AISI 1020, *pack carburizing*, karbon arang kayu jati, CaCO_3 , cangkang keong mas, kekerasan Vickers, struktur mikro, *martensite*.

ABSTRACT

AISI 1020 steel is a low-carbon steel widely used in industrial machinery components due to its ductility and ease of manufacturing. However, this steel has relatively low surface hardness and wear resistance, requiring improvement. One method that can be used is pack carburizing. This study aimed to determine the effect of variations in the carbon (C) composition of teak wood charcoal and calcium carbonate (CaCO_3) catalyst from golden apple snail shells on the Vickers hardness value and microstructure of AISI 1020 steel.

The study was conducted using ten AISI 1020 steel specimens that were first normalized at 915°C for 60 minutes. Eight specimens were then pack carburized at 950°C for 60 minutes after normalizing, using four different media compositions, each with two test specimens. The composition variations used were 100% C, 90% C: 10% CaCO_3 , 70% C: 30% CaCO_3 , and 50% C: 50% CaCO_3 . After the specimens underwent pack carburizing, they were quenched using water. Tests performed included Vickers hardness and microstructural observations using a metallographic microscope on two normalizing specimens and eight normalizing, pack carburizing, and quenching specimens.

The results showed that variations in pack carburizing media composition significantly increased the hardness and changed the microstructure of AISI 1020 steel. The normalizing specimens had average hardness values of 123.48 HV and 121.86 HV, respectively. After pack carburizing treatment, the hardness results obtained at 90% C: 10% CaCO_3 variations were 789.90 HV and 768.66 HV, 100% C variations were 684.30 HV and 588.04 HV, 70% C: 30% CaCO_3 variations, and 50% C: 50% CaCO_3 variations. The 90% C: 10% CaCO_3 variation produced the most dominant martensite structure with the highest hardness value and the largest carbon diffusion depth of 710 μm and 678 μm .

Keywords: AISI 1020 steel, pack carburizing, teak wood charcoal carbon, CaCO_3 , golden snail shell, Vickers hardness, microstructure, martensite.