

ABSTRAK

MEKANIS PROPERTIS MATERIAL 9Cr-1Mo-SS316L UNTUK KELONGSONG BAHAN BAKAR NUKLIR REAKTOR DAYA

Dalam penelitian ini dikembangkan Baja SS316L dan Baja 9Cr-1Mo yang dimodifikasi. Tujuannya untuk menganalisis hasil uji kekerasan, uji impact, uji bending dan struktur mikro. Elemen Mo di pilih karena memiliki penampang mikroskopis neutron yang cukup kecil yakni 2,6 barn. Unsur Mo berada dalam satu periode periodik dengan Zr dan juga Nb, sehingga sifat mekanik dan sebagainya tidak jauh berbeda. Pada penelitian ini dibuat sampel Baja SS316L dan Baja 9Cr-1Mo modifikasi. Sampel material 90% SS316L + 9%Cr +1% Mo selanjutnya dilebur dengan peleburan busur listrik. Setelah proses peleburan selesai selanjutnya dilakukan tempering yaitu sampel terdiri dari 6 buah, 1 sampel tidak mendapat perlakuan tempering atau tanpa tempering sedangkan 5 sampel lainnya mendapat perlakuan tempering dengan cara sampel dimasukkan ke dalam *Furnace*, lalu *Furnace* di nyalakan dan temperatur diatur 100°C, setelah angka digital pada *Furnace* menunjukkan 100°C, maka *Furnace* di stop dan sebuah sampel dikeluarkan menggunakan jepitan lalu di celupkan ke oli. Selanjutnya *Furnace* di setting pada temperatur 200°C, dan setelah *Furnace* temperatur nya 200°C satu sampel dikeluarkan dan di celupkan ke oli. Begitu juga dengan sampel yang lainnya untuk tempering 300°C, 400°C, dan 500°C. Setelah itu sampel diuji yaitu uji kekerasan rockwell, uji impak, struktur mikro, uji bending, dan sifat lain dari sampel material. Hasil uji kekerasan, hasil uji impak, hasil uji bending dan struktur mikro akan dianalisis. Hasil pengujian dan perhitungan Uji kekerasan Rockwell penurunan nilai kekerasan tertinggi adalah pada spesimen 1 (*non treatment*) yaitu 21,33 HRc dan penurunan terendahnya adalah pada spesimen 6 (*heat treatment*) 500⁰ C yaitu 16,66 HRc. Untuk hasil uji impak energi *Impact* (EI) dengan nilai rata-rata tidak terlalu ada perbedaaan yg cukup signifikan yaitu nilai tertinggi 1,0034 joule/mm² pada specimen 2 (*heat treatment*) dan nilai terendah 1,0020 joule/mm² pada spesiment 6 (*heat treatment*) 500⁰ C. Hasil uji mikrostruktur menunjukan kandungan ferrit dan pearlit masih terdapat pada benda uji. Hasil uji tekuk tertinggi pada sampel 6 dengan tempering 500⁰C memiliki kekuatan menahan beban maksimum sebesar 1050 Newton sehingga kekuatan tekuknya sebesar 7875 kgf/cm² dan hasil terendahnya pada sampel 1 tanpa tempering memiliki kekuatan menahan beban maksimum sebesar 670 Newton, sehingga kekuatan tekuknya sebesar 5025 kgf/cm².

Kata kunci: Sifat Mekanik, Sifat Fisika, 9Cr-SS316L-1Mo, Kelongsong Bahan Bakar Nuklir, Reaktor Daya.

ABSTRACT

MECHANICAL PROPERTIES OF MATERIAL 9Cr-1Mo-SS316L FOR CLAIMING OF NUCLEAR FUEL POWER REACTORS

In this research, SS316L steel and modified 9Cr-1Mo steel were developed. The aim is to analyze the results of the hardness test, impact test, bending test and microstructure. The Mo element was chosen because it has a relatively small microscopic cross-section of the neutron, which is 2.6 barns. The element Mo is in the same periodic period as Zr and Nb, so that the mechanical properties and so on are not much different. In this study, samples of SS316L steel and modified 9Cr-1Mo steel were made. Material samples of 90% SS316L + 9% Cr + 1% Mo were then melted by electric arc melting. After the smelting process is complete, then tempering is carried out, namely the sample consists of 6 pieces, 1 sample does not receive tempering treatment or without tempering while the other 5 samples receive tempering treatment by placing the sample into the Furnace, then the Furnace is turned on and the temperature is set to 100°C, after the digital number on the Furnace shows 100°C, then the Furnace is stopped and a sample is removed using tongs and then immersed in oil. Furthermore, the furnace is set at a temperature of 200°C, and after the furnace temperature is 200°C, one sample is taken out and immersed in the oil. Likewise with other samples for tempering 300°C, 400°C, and 500°C. After that the samples were tested, namely the rockwell hardness test, impact test, microstructure, bending test, and other properties of the sample material. Hardness test results, impact test results, bending test results and microstructure will be analyzed. Test results and calculations Rockwell hardness test The highest decrease in hardness value was in specimen 1 (non-treatment) which was 21.33 HRC and the lowest decrease was in specimen 6 (heat treatment) 5000 C which was 16.66 HRC. For the results of the Impact energy impact test (EI) with an average value there is not too much difference which is quite significant, namely the highest value is 1.0034 joules/mm² in specimen 2 (heat treatment) and the lowest value is 1.0020 joules/mm² in specimen 6 (heat treatment) 5000 C. The results of the microstructural test showed that the ferrite and pearlite content was still present in the test object. The highest bending test result in sample 6 with 5000C tempering has a maximum load-bearing strength of 1050 Newton so that the bending strength is 7875 kgf/cm² and the lowest result is in sample 1 without tempering having a maximum load-bearing strength of 670 Newton, so the bending strength is 5025 kgf/ cm².

Keywords: Mechanical Properties, Physical Properties, 9Cr -1Mo-SS316L, Nuclear Fuel Cladding, Power Reactor.