

# Pengaruh penambahan surfaktan sodium dodecyl benzene sulfonate terhadap konduktivitas termal nanofluida berbasis graphene oxide sebagai media quench terhadap kekerasan baja S45C hasil perlakuan panas = Effect of addition of surfactant sodium dodecyl benzene sulfonate to thermal conductivity of graphene oxide nanofluids as quench media to hardness of S45C heat treatment results

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## Abstrak

Graphene oxide (GO) adalah graphene teroksidasi yang memiliki ikatan dan gugus fungsi. GO memiliki konduktivitas termal yang baik sehingga dapat digunakan dalam aplikasi perpindahan panas, salah satunya nanofluida. Gugus fungsi O pada graphene oxide membuat sifatnya menjadi hidrofilik untuk dispersi terhadap media larutan cair, sehingga dapat diaplikasikan sebagai media quenching. Dalam penelitian ini graphene oxide dikarakterisasi menggunakan Energy Dispersive Spectroscopy (EDS) dan Scanning Electron Microscope (SEM) untuk mengetahui kandungan unsur dan morfologi dari GO. Nanofluida berbasis GO disintesis dengan konsentrasi GO sebesar 0,01%, 0,03% dan 0,05% dengan menambahkan surfaktan Sodium Dodecyl Benzene Sulfonate (SDBS) sebanyak 0%, 3%, 5% dan 7% pada fluida dasar air distilasi. Nanofluida yang diperoleh diultrasonifikasikan selama 15 menit kemudian dilakukan pengujian konduktivitas termal dan zeta potensial. Setelah itu dilakukan proses quenching menggunakan baja S45C dengan nanofluida sebagai media quench dengan suhu austenisasi 900oC dengan waktu tahan selama 1 jam, kemudian dilakukan pengujian metalografi dan kekerasan. Hasil karakterisasi GO menunjukkan terdapat gugus O dan hasil pengujian konduktivitas termal menunjukkan bahwa nilai konduktivitas termal menurun seiring dengan peningkatan kadar GO dan surfaktan SDBS dan kekerasan optimal baja S45C hasil quenching terdapat pada konsentrasi nanofluida GO 0.05% dan SDBS 5% dengan nilai kekerasan sebesar 48 HRC.

.....Graphene oxide (GO) is a graphene that has been oxidized and has bonds and functional groups. GO has a high thermal conductivity so that it can be used in heat transfer applications, one of which is nanofluids. The O functional group in graphene oxide makes it hydrophilic for dispersion on liquid solution media, so it can be applied as a quenching medium. In this study, graphene oxide was characterized using Energy Dispersive Spectroscopy (EDS) and Scanning Electron Microscope (SEM) to determine the elemental content and morphology of GO. GO-based nanofluids were synthesized with GO concentrations of 0.01%, 0.03% and 0.05% by adding the surfactant Sodium Dodecyl Benzene Sulfonate (SDBS) as much as 0%, 3%, 5% and 7% in distilled water base fluid. The obtained nanofluids was ultrasonified for 15 minutes and then tested for thermal conductivity and zeta potential. After that, the quenching process was carried out using S45C steel with nanofluids as the quenching medium with an austenizing temperature of 900oC with a holding time of 1 hour, then metallographic and hardness tests were performed. The results of GO characterization showed that there was an O group and the results of the thermal conductivity test showed that the value of the thermal conductivity decreased with increasing levels of GO and SDBS surfactant and optimal hardness value of S45C steel as a result of quenching is found in nanofluids concentration of 0.05% GO and 5% SDBS with a hardness value of 48 HRC.