Pengaruh Penambahan Sodium Dodecylbenzene Sulfonate Sebagai Surfaktan Anionik Terhadap Kestabilan Nanofluida Berbasis Karbon untuk Media Pendingin pada Proses Quenching = Effect of Sodium Dodecylbenzene Sulfonate Addition as Surfactant on Water-Based Carbon Nanofluid for Quenching Medium in S45C Medium Carbon Steel Heat Treatment

Laurent Oktavio Matra, author

Abstrak

Quenching process is performed as part of heat-treatment for steels in order to enhance mechanical properties, by rapid cooling to room temperature. Quenching is done to obtain certain properties or microstructure by inequilibrium cooling to prevent any phase transformation to occur, thus giving the desired phase at room temperature. In recent developments, the addition of microparticles to the quench media, referred to as microfluid, is done to improve its thermal conductivity which in turn, accommodate heat dissipation. Lab-grade carbon powders were added as the nanoparticle to a water-based quench media. Microparticles were synthesized using the top-down method, where size reduction of the particles was done by grounding using a planetary ball mill for 15 hours at 500 rpm. Particle size, composition, and morphology of the particles were measured by Field-Emission Scanning Electron Microscope (FE-SEM), and Energy Dispersive X-Ray Spectroscopy (EDX).
Water-based microfluids with volumes of 100ml were produced using the two-step method, by mixing carbon nanoparticles at 0.1%, 0.3%, and 0.5% in various concentration of anionic surfactant Sodium Dodecylbenzene Sulfonate of 1%, 3% and 5% respectively. Austenization of AISI 1045 or JIS S45C steels at 1000ºC were done prior to quenching.
Results of the hardness value corresponds to the severity of the quenching mediums, with peak hardness of 845 HV for 0.1% carbon with 1% SDBS, 848 HV for 0.3% carbon with 3% SDBS and 878 HV for 0.5% carbon with 3% SDBS. The hardness value shows a significant improvement over hardness results without SDBS addition. Excess surfactant addition, however, yields a lower hardness due to the re-agglomeration of particles