

**PEMBUATAN NANOFLUIDA Al_2O_3 DARI NANOPARTIKEL Al_2O_3
HASIL SINTESIS MENGGUNAKAN METODE SOL GEL DENGAN
TEPUNG TAPIOKA SEBAGAI *CAPPING AGENT* UNTUK APLIKASI DI
RADIATOR**

SKRIPSI

Diajukan untuk memenuhi salah satu syarat dalam memperoleh gelar Sarjana Sains
Departemen Pendidikan Fisika Program Studi Fisika
Konsentrasi Fisika Material



Oleh

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**PROGRAM STUDI FISIKA
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FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN ALAM
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ABSTRAK

Pembuatan nanofluida air- Al_2O_3 dari nanopartikel Al_2O_3 hasil sintesis menggunakan metode sol gel dengan tepung tapioka sebagai *capping agent* untuk aplikasi di radiator telah dilakukan. Nanofluida air- Al_2O_3 disintesis menggunakan metode dua langkah (*Two step method*) dengan dua konsentrasi berbeda yaitu 0,1 % wt dan 0,2 % wt. Pengujian *heat transfer* pada penelitian ini menggunakan set alat radiator dengan menjaga tetap laju aliran fluida dan suhu inlet sebesar 3,3 LPM (liter/menit) dan 50°C. Serbuk nanopartikel Al_2O_3 dikarakterisasi menggunakan *X-ray diffraction* (XRD) dan *Surface Area Meter*. Hasil karakterisasi XRD menunjukkan nanopartikel Al_2O_3 yang telah disintesis merupakan alpha- Al_2O_3 . Ukuran kristal dan ukuran partikel nanopartikel Al_2O_3 sebesar 36,25 nm dan 80,47 nm. Potensial zeta nanofluida air- Al_2O_3 yang dihasilkan sebesar -35,26 mV dan -37,83 mV untuk konsentrasi 0,1 % wt dan 0,2 % wt. Penambahan konsentrasi pada nanofluida meningkatkan *heat transfer* pada radiator. *Convective Heat Transfer Coefficient* dan *Overall Heat Transfer Coefficient* masing-masing meningkat sebesar 139,52% dan 168,31% dibandingkan air sebagai fluida dasar.

Kata Kunci : Nanofluida, Nanopartikel, Al_2O_3 , Tepung Tapioka, *Convective Heat Transfer Coefficient*, *Overall Heat Transfer Coefficient*

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**FABRICATION OF Al₂O₃ NANOFLUIDS FROM Al₂O₃
NANOPARTICLES SYNTHESIZED USING SOL GEL METHOD WITH
TAPIOCA STARCH AS CAPPING AGENT FOR APPLICATION IN
RADIATOR**

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ABSTRACT

Fabrication of water-Al₂O₃ nanofluids from Al₂O₃ nanoparticles synthesized using sol gel method with tapioca starch as capping agent for application in radiator were successful. Water-Al₂O₃ nanofluids synthesized with two step method with two different concentration 0,1 % wt and 0,2 % wt. Heat transfer test in this study using radiator machine with constant fluids flow and inlet temperature with 3,3 LPM (liter/minute) and 50°C. The powder of Al₂O₃ nanoparticles were characterization with X-ray diffraction (XRD) and Surface Area Meter. The result of XRD analysis show Al₂O₃ nanoparticles was synthesized is alpha-Al₂O₃. Crystallize and particle size of Al₂O₃ nanoparticles was 36,25 nm and 80,47 nm. Zeta potential of water-Al₂O₃ nanofluids was -35,26 mV and -37,83 mV for Al₂O₃ concentrations of 0,1 % wt and 0,2 % wt. Addition of concentration of nanofluids increases heat transfer of radiator. Convective Heat Transfer Coefficient and Overall Heat Transfer Coefficient increases up to 139,52% and 168,31% compared with water as base fluids.

Keywords : Nanofluids, Nanoparticles, Al₂O₃, Tapioca starch, Convective Heat Transfer Coefficient, Overall Heat Transfer Coefficient

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