**ABSTRACT**

In the present study, reduced graphene oxide (rGO) is synthesized from graphite using modified Hummer and chemical reduction methods. Various characterizations techniques are carried out to study the in-plane crystallite size, number of layers, presence of functional groups and surface morphology. Different concentrations of 0.01, 0.1, and 0.3 g/l of rGO/water nanofluids are prepared by dispersing the flakes in DI water. The colloidal stability of 0.3 g/l concentration is measured after 5 days using Zetasizer and found to be stable. The rGO/water nanofluids are then used to study the effect on the enhancement of critical heat flux (CHF) in pool boiling heat transfer. Results indicate an enhancement in CHF ranging from 145 to 245 % for the tested concentrations. The mechanisms of CHF enhancement are analyzed based on surface wettability, surface roughness, and porous layer thickness. The macrolayerdryout model sufficiently supports the mechanism of CHF enhancement of thin wire with rGO deposits, which is not reported yet.