Investigation of the convective heat transfer in water-based Alumina nanofluid\(^1\) SHENG-QI ZHOU, RUI NI, KE-QING XIA, Department of Physics, The Chinese University of Hong Kong — Recent research has suggested that nanofluids have great potential in thermal applications due to their significantly high thermal conductivity [1]. But the buoyancy-driven convective flow would play an important role in the heat transport process. We have conducted an experimental measurement of the convective heat transfer in water-based Al\(_2\)O\(_3\) nanofluid in a cylindrical cell (19 cm in both height and diameter). The nominal diameter of Al\(_2\)O\(_3\) particle is 45 nm. At the fixed heating power, \(Q = 513\) W, it has been found that the convective heat transfer coefficient \((h = Q/\Delta T, \Delta T\) is the temperature difference across the cell\.) decreases to 2% when the volume fraction of nanoparticle, \(\phi\), increases from 0.03% to 1.1%. At \(\phi = 1.1\)%, we examined the relationship between Nusselt number \((Nu)\) and Rayleigh number \((Ra)\) of nanofluid. It has been found that the \(Nu\)–\(Ra\) scaling of nanofluid follows that of pure water at higher \(Ra\) (> \(3 \times 10^9\)). At lower \(Ra\) (< \(3 \times 10^9\)), a deviation occurs, and it becomes more pronounced with decreasing \(Ra\)./ [1]. J. A. Eastman et. al., Annu. Rev. Mater. Res. 34 219, (2004).

\(^1\)Work supported by the Research Grants Council of Hong Kong SAR (Project Nos. 404307 and and 404808).