# Investigation of mechanical and drying shrinkage properties of hydrothermally treated cement systems with reactive magnesia and alumina-silica rich clay brick waste

B. Liu, A. Ray* and P.S. Thomas
Department of Chemistry and Forensic Sciences, University of Technology, Sydney, P.O. Box 123, Broadway, Sydney, NSW 2007 Australia.
*Email: A.Ray@uts.edu.au

## Abstract

In recent years, worldwide research and development in the cement industry has gathered momentum with an aim to explore innovative and sustainable methods to deliver environmentally responsible Portland Cement (PC) based construction products. This study aims to investigate physical and mechanical properties of autoclaved cement-quartz sand blends with the addition of clay-brick waste (CB waste) and reactive magnesia (MgO) in order to reduce PC consumption and $CO_2$ emissions. Mechanical properties and drying shrinkage showed improvements with the incorporation of CB waste due to increased amounts and crystallinity of Al-tobermorite. The addition of reactive MgO to PC in hydrothermal conditions was observed to have a negative effect on the compressive strength. XRD data indicated that MgO did not take part in the reaction during the hydration of the cement and may even retard tobermorite formation. However, the expansive nature from the hydration of MgO to brucite may have compensated for drying shrinkage.