# Microstructural and mechanical properties investigation of Mg-Al-Zn alloy counter gravity investment

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One of the most effective ways of improving the fuel consumption and hence reducing the environmental impact of transport vehicles is via reduction in mass. This has resulted in the increased use of magnesium (Mg) to reduce the mass of vehicles. The most common manufacturing method for the production of Mg components is via High Pressure Die Casting (HPDC), however, this process is suitable for high volume thin walled components. Investment casting offers the capability of producing complex near-net shaped components; however, due to the high reactivity of Mg with silica, conventional colloidal silica shell systems cannot be used. The reactivity with shell system can be mitigated by using a shell system, in particular, the face coat which does not react with molten Mg and an appropriate inhibitor/purge gases during the casting process. Mg, in the molten state, reacts with water, nitrogen and some oxides such as $CaSO_4$, $SiO_2$ and $Fe_2O_3$. In order to minimize this problem the shell system used must have a face coat that has very low (preferably free of) $CaSO_4$, $SiO_2$ and $Fe_2O_3$ content. Gravity investment casting moulds need to be designed well in order to minimize turbulence during filling of the mould. The use of counter gravity investment (CGI) casting allows the filling of the mould to be better controlled. By appropriate process control and mould design, turbulence during filling can be minimized hence reducing porosity and improving the quality. The main aim of the current project was to investigate the face coat/metal interaction and mechanical properties of counter gravity investment cast magnesium alloy AZ91D.