# A New Methodology to Manufacture Biodegradable Magnesium Stents

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Stent manufacturing is usually performed by laser cutting, being both expensive and complex due to the required fine geometric and dimensional details. This is especially relevant in bioabsorbable magnesium alloys due to their high reactivity.

This study details the development of a novel methodology to manufacture thin-walled biodegradable magnesium stents. This technique uses additive manufacturing, Yttria-based coatings and vaccum to cast an Eco-magnesium alloy (AZ91D-1 wt.% CaO) into a ceramic mold while preventing significant exothermal reactions and avoiding the use of toxic $SF_6$ protective atmospheres.

The analysis to cast samples (i.e. stents) shows the Yttria coating is essential to prevent catastrophic exothermal reactions. Interestingly, when vacuum is used, there is a slight increase in surface reaction, however, the lack of atmosphere ensures an enhanced thin-wall cavity filling. Lower casting temperatures seem to be benefitial to mitigate reactions, however, the higher viscosity of the melt reduces the thin-wall cavity filling.

These combination of these variables allows the filling of extremely fine crossections (0.4-0.8 mm) with good surface finish and high dimensional/geometric accuracy that are required for most stent designs.