

# The effect of mechanical alloying on the deformation behaviour of Ti-Mg alloys

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## Abstrak

Mechanical alloying (MA) was used to produce Ti-xMg alloys ( $x = 0, 2.5, 5, 7.5, 10$  wt%Mg), and powders alloys of Ti-Mg were characterized by X-ray diffraction and Optical microscope. Investigation shows that the homogenous structure have not yet been obtained as milling Ti and Mg for 4 hours, but XRD traces indicated that mechanical alloying have produced Ti-Mg alloys as Mg peaks has disappeared from the traces. XRD results also showed that mechanical alloying and addition of Mg have direct effect on XRD broadening. Powder alloys were compacted using severe plastic deformation method, ECAP. Using Archimedes principle the density of Ti-Mg solid samples were measured and results shows that the density decreased as Mg content increases. Relative density on compacted powders indicates that ECAP has produced in excess of 98% density on each sample, and annealing improved the density. Microstructure observation using SEM shows that ECAP has produced good inter-particles boundaries as well as some porosity and undissolved Mg particles can be observed. After annealing there is improvement in boundaries in samples containing Mg, but at the same time cause segregation of Mg, which indicates diffusion of Mg occurs faster during annealing at 600\_C. Mechanical properties measurement was conducted by ball indentation test method on annealed and un-annealed bulk samples, and the result were studied and analysed carefully, however, the final result of mechanical properties were not well understood and still require further and deeper investigation in the future.