The aim of this diploma thesis is to investigate microstructure and thermal stability of ultra fine grained magnesium alloys. The thesis first summarises methods using plastic deformation in order to achieve ultra fine grained structure that are used to process metals. Then experimental methods employed in the experimental part including microhardness testing, scanning electron microscopy and positron annihilation spectroscopy are described. Brief summary of previous research on MgZnY alloys strengthened by quasicrystalline phases and $Mg_{22}Gd$ alloys is given. Finally, results of experimental investigation of MgZnY alloys with various Zn/Y ratios and $Mg_{22}Gd$ alloy are discussed. These results suggest that presence of phases in MgZnY alloys depend on Zn/Y ratio, hardness of these alloys depends on Zn content and that rapid cooling of MgZnY alloys annealed at 500 °C lead to significant increase in volume fraction of quasicrystalline icosahedral phase. In the second section of the experimental part thermal behaviour of $Mg_{22}Gd$ alloy is investigated. Furthermore, formation of GdH_2 particles in $Mg_{22}Gd$ is examined and attributed to reaction of hydrogen decomposed from water vapour with gadolinium in areas rich in gadolinium. Finally, significant hardening of $Mg_{22}Gd$ alloy processed by high pressure torsion has been observed and investigated.