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Mg rich alloys and new Mg rich phases: Applications for structural materials, hydrogen storage and generation

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The interest in magnesium alloys has increased over the past thirty years, especially because magnesium is abundant in nature, cheap and lightweight. Numerous studies have been devoted to the research of new Mg-based light structural materials. Among the problems that have limited their wide use in industry, one can cite its poor resistance to corrosion. This problem which can be overcome by a certain extent can even be turned to an advantage for the use of these materials in biomedical applications (bioresorbable load-bearing implants). Besides these structural applications, magnesium and magnesium alloys are also good candidates for solid storage of hydrogen through the formation of metal hydrides. Moreover, a new interest in the hydrolysis reaction between Mg or Mg alloys and water for hydrogen generation has recently emerged. This would be an interesting way to recycle Mg-based alloys wastes. For all these reasons, a reinvestigation of the Mg-rich zone of many ternary (and quaternary) systems has been carried out in the last years. Our group has focused this studies on the Mg-rich part of the RE-T-Mg systems (RE=rare-earth, T=transition metals). We will present here the results obtained on the Nd-Ni-Mg system. We have recently discovered two new ordered phases NdNiMg₅ and NdNiMg₁₅ and their structural and magnetic properties have been characterized. Following this discovery, the composites (Mg)_{1-x}(NdNiMg₁₅)_x (0<x<1) have been studied for their properties as structural materials and materials for hydrogen generation or storage.

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