Synthesis of heterostructured Al-Mg system with extreme specific strength through the application of high-pressure torsion

By Jae-Kyung Han
Candidate for Master of Science in Materials Science
Major Professor: Dr. Kawasaki

Abstract

Processing of metals through the application of high-pressure torsion (HPT) provides significant grain refinement in bulk metals at ambient temperatures. The ultrafine-grained (UFG) materials processed by HPT generally demonstrate the superior physical and mechanical characteristics. For utilizing the benefit of HPT, the feasibility of conventional HPT processing was demonstrated recently for the synthesis of bulk hybrid metals and alloys for a short period of time at room temperature. In the present study, the production of an Al-Mg nanostructured hybrid system was demonstrated by mechanical bonding of separate Al and Mg by means of HPT under a compressive pressure of 6.0 GPa for up to 60 turns at room temperature. A series of analyses were performed to examine the evolution of microstructure and mechanical properties and to evaluate the feasibility of HPT processing. The results demonstrate a significant opportunity for making use of HPT for the solid-state reaction of dissimilar metals to synthesize hybrid engineering materials consisting of intermetallic-based metal matrix nanocomposites (MMNC) and/or supersaturated solid solutions.

Monday, November 25, 2019
10:00 AM, Rogers 226

School of Mechanical, Industrial and Manufacturing Engineering
Oregon State University