

Fabrication of Functionally Gradient Porous Aluminum Using NaCl as Space Holder

Yoshihiko Hangai, Ryosuke Suzuki

Faculty of Science and Technology, Gunma University

Summary

Functionally graded (FG) aluminum (Al) foam, which consists of multilayers of different Al foams, is expected to exhibit higher functionality than ordinary uniform Al foam. In this study, a three-layered FG Al foam with different types of Al (pure Al, AC4CH and A6061 with different tensile strength) and different porosities were fabricated by a sintering and dissolution process using spark plasma sintering (SPS). From X-ray computed tomography (CT) inspection of the obtained foams, it was confirmed that NaCl was completely removed from the foams by dissolution. In addition, the FG Al foams in each layer had almost constant porosity (NaCl volume fraction, V_f) with seamless bonding between the layers. From the static compression tests of uniform foams, it was shown that the compression properties can be controlled by varying the type of Al and porosities. From the static compression tests of FG Al foam, it was shown that the foams exhibited multiple compression properties corresponding to the deformation of each layer for various V_f and different types of Al. The advantage of varying the type of Al is that the other properties of foams such as corrosion resistance can be controlled without changing their geometric structures. Therefore, FG Al foams with various V_f and types of Al are expected to enable the optimum design of foams used for structural materials.