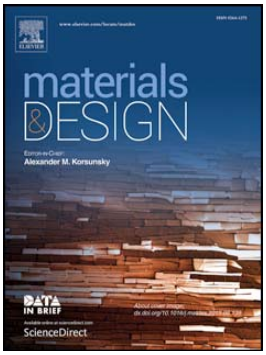

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Introducing equiaxed grains and texture into Ni-Mn-Ga alloys by hot extrusion for superplasticity

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Abstract: Ni-Mn-Ga alloys are generally brittle, making it difficult for shaping complex components by conventional plastic deformation. Here we demonstrated that superplastic deformation capability occurred in a $Ni_{47.4}Mn_{31.5}Ga_{21.2}$ alloy prepared by extrusion. The extrusions were carried out at 1273 K and 1323 K with extrusion ratios of 9:1, 12:1 and 16:1, in which equiaxed grains and a <111> texture were created by the coupled dislocation slip and dynamic recrystallization process. The size of the equiaxed grains, varied from 61.8-75.7 microns, showed a stronger dependence on extrusion temperature than the extrusion ratio. At a strain rate of 10^{-3} s^{-1} and temperature of 1073 K, the extruded alloy exhibited a tensile superplastic elongation of 225.0 %, much higher than that in the as-cast alloy (57.9 %). This shows that the B2 phase exhibits a good superplastic deformation capacity at temperatures above the ordering temperature. The mechanism of the superplasticity in the extruded alloys was determined to be the dynamic recrystallization process driven by the accumulated dislocations formed through dislocation slip.