TECHNOLOGY

# Method of Selectively Texturing Polycrystalline Fe-Ga Alloys to the Orientation

## OVERVIEW

Iron/gallium (Fe-Ga) alloys are known as a magnetostrictive alloy called Galfenol. Magnetostrictive materials are broadly defined as materials that undergo a change in shape due to change in the magnetization state of the material. Nearly all ferromagnetic materials exhibit a change in shape resulting from magnetization change. The percentage of change in shape and the temperatures in which a change occurs dictate the applicatios of use for such materials.

Researchers at the University of Maryland have developed GALFENOL magnetostrictive actuators and sensors have a large saturation magnetostriction potential (~400 ppm) in low applied fields (~200 Oe). It was recently reported that textured polycrystalline Fe83Ga17 exhibits magnetostrictive strain of ~170 ppm as a consequence of rolling and annealing. In order to achieve maximum performance in polycrystalline form, we examine the surface-energy-induced selective growth of {100} or {110} grains in a controlled sulfur environment during final annealing. We build on results from selective development of Goss texture in Fe-Si alloys, an a-iron alloy that is similar to Fe-Ga. Kohler suggests that although {110} growth occurs under very clean surface conditions, {100} growth occurs under slight surface contamination with sulfur due to adsorption of the sulfur.

Doped Fe-18.7 at.%Ga were successfully fabricated using a rolling process, where improves the ductility of these alloys due to suppressing grain boundary fracture and sulfur assists with formation of selective grain growth controlled by surface-energy-induced recrystallization.

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# Additional Information

## INSTITUTION

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## CATEGORIES

- Chemical

## EXTERNAL RESOURCES

- US Patent 8,591,669