# Preparation of microstructured and nanostructured magnetic materials by mechanical deformation

Giguere A., Hai N.H., Dempsey N., Givord D.
Laboratoire Louis Néel, CNRS, 25 avenue des Martyrs, 38042 Grenoble Cedex 9, France; Cryolab, Faculty of Physics, University of Hanoi, Viet Nam

Abstract: A novel hydrostatic extrusion process utilising sacrificial Al billets has been developed to allow the size reduction by deformation of samples of various cross-sectional shape (e.g. square, rectangular). Cyclic deformation of a stack of sub-mm thick foils of magnetic and non-magnetic metals (Fe and Ag), combining extrusion with cold-rolling, has been used to prepare nanoscaled multilayered structures. 6% GMR was measured in the Fe/Ag multilayer system, after 4 deformation cycles, in the current-in-plane geometry at 4K. Extrusion was also used to prepare micro-composite Sm/Fe structures which were subsequently heat treated to form magnetostrictive $SmFe_2$ rods with room temperature magnetostriction values as large as -800ppm in the extrusion direction. 
Author Keywords: Cold-rolling; Giant magnetoresistance; Hydrostatic extrusion; Magnetostriction
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Correspondence Address: Giguère, A.; Laboratoire Louis Néel, CNRS, 25 avenue des Martyrs, 38042 Grenoble Cedex 9, France; email: giguere@labs.polycnrs-gre.fr
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Authors with affiliations:

- Giguère, A., Laboratoire Louis Néel, CNRS, 25 avenue des Martyrs, 38042 Grenoble Cedex 9, France
- Hai, N.H., Laboratoire Louis Néel, CNRS, 25 avenue des Martyrs, 38042 Grenoble Cedex 9, France, Cryolab, Faculty of Physics, University of Hanoi, Viet Nam
- Dempsey, N., Laboratoire Louis Néel, CNRS, 25 avenue des Martyrs, 38042 Grenoble Cedex 9, France

• Givord, D., Laboratoire Louis Néel, CNRS, 25 avenue des Martyrs, 38042 Grenoble Cedex 9, France

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