Contribution ID: **160** Type: **Talk (20 min + 5 min discussion)**

Shape and size distribution of the magnetic domain structure in electrical steel measured with neutron grating interferometry

Monday, 4 December 2023 15:25 (25 minutes)

The magnetic flux guidance in an electric engine is achieved by introducing cutouts in the electrical steel (ES) sheets that make up its core. However, these cutouts create thin structures, reducing the mechanical strength of the ES sheets and limiting the achievable rotational speed and therefore the energy efficiency of the engine. We successfully created a novel type of magnetic flux barrier by introducing residual stress states in ES to reduce the local magnetic permeability. Such barriers show similar flux guidance as traditional barriers while the mechanical strength is comparable to unworked ES.

To prove the applicability of such magnetic flux barriers in future electric drives, and understand the changes to the local magnetic domain distribution, neutron grating interferometry (nGI) is applied to map ultra-small-angle neutron scattering off the magnetic domain structure in ES.

NGI probes the slit-smeared real space correlation function of the system at a specific correlation length.

In this presentation we will show the application of nGI to assess the structure size and shape of the magnetic domain structure in non-grain-oriented electrical steel by probing different correlation lengths and the anisotropy of the spatially resolved USANS signal recorded by nGI.

Primary author: SEBOLD, Simon (MLZ)

Co-authors: Mr SCHAUERTE, Benedikt (IEM); Mrs GILCH, Ines (utg); SCHULZ, Michael; NEUWIRTH, Tobias

Presenter: SEBOLD, Simon (MLZ)

Session Classification: Neutron Methods

Track Classification: Neutron Methods