Recent Trends in FeCo-Based Magnetic Nanocomposite Development and Grand Challenges for Advanced Characterization Techniques

FeCo-based magnetic nanocomposites are state-of-the-art soft magnetic materials in which a high resistivity intergranular phase separates FeCo-metallic nanoparticles allowing for an optimal combination of high saturation induction, high temperature stability, and low losses at high frequencies. The increasing importance of advanced soft magnetic materials for high frequency power electronics and power conditioning applications has resulted in an increase in both applied and fundamental research activity in this area in recent years. An emphasis has been placed on developing novel compositions and/or processing strategies for reducing losses at frequencies in the range of 100kHz - 1MHz. An overview of the various strategies currently being pursued will be presented in the context of the primary contributions to losses in this frequency range and recent results of both fundamental and applied investigations will be highlighted. Finally, a set of grand challenges for advanced characterization needs will be presented that could potentially answer key fundamental issues and enable breakthrough advances in understanding.