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M2Po2D-01: Characteristics of Laminates with Magnetic Properties for Motor Slot Wedges and Other Applications at Cryogenic Temperatures

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Modern and versatile, magnetic laminates have found a multitude of industrial applications. This work explores the structure and properties of these materials, exploring their utilization in transformers, electric motors, and protection systems. A laminate was constructed of "E"type glass fiber with a magnetite-filled epoxy matrix. The objective was to develop a soft ferromagnetic laminate composite with improved mechanical properties, especially fracture strength, and toughness. We made composites with varying levels of magnetic particle fill fractions and then measured the mangetic saturation and permeability as a function of temperature. We also measured the core losses and eddy current losses at 77 K at frequencies from 45 Hz to 200 Hz. We measured the mechanical properties at 77 K and compared the results at various fill levels to those of a control composite made with Fe as the magnetic phase. The results of these studies will pave the way for optimizing and modifying its magnetic properties. This research lays the foundation for the development of cutting-edge laminates that can perform even in cryogenic conditions.

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