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Measurement of Magnetic Materials at Room And Cryogenic Temperature for Their Application to Superconducting Wind Generators

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Compact, lightweight and large-scale generators are desired for offshore wind energy application due to transportation and installation requirements. In order to reduce the levelized cost of wind energy, larger and larger wind turbines are under researches and superconducting wind generators are proposed as they have high power density and light weight. Due to the expensive price of the superconductor, iron core is usually employed to reduce consumption of the superconductor as well as to divert the flux direction to the superconductor. However, in many designs and studies, losses and permeability of the silicon lamination sheets used in cryogenic temperature are from room temperature, which is not appropriate. Hence, the performance of the silicon lamination sheets at low temperature is essential and in urgent need to develop and commercialize the superconducting wind generators. We made magnetic properties tests of toroidal cores at both room temperature and 77 K with four different materials and the result shows that the permeability of silicon sheets and losses are higher at 77 K than room temperature.

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