

Investigation on core loss characteristics of 3% SiFe by using the laser scribing method

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SiFe(silicon steel) are used for numerous core-laminated products, such as electrical motors, high power transformer, and inductors, etc. When these steels are magnetized in motors and transformers under alternating current conditions, core loss induced in the steel is one of the important factors that degrade the performance of the electrical instruments. The core loss is strongly dependent on silicon content, impurities, permeability, and domain structure of the steel[1]. Domain refining has been proved to be very good method for reduction of core loss in high permeability grain oriented Si steels[2, 3], and laser scribing is well-known as an effective and industrially important method of domain refinement (Fig. 1). In this work, magnetic domain refinement has been carried out by using a pulsed and Q-switched Nd:YAG laser, and the core losses have been measured and analyzed to find optimal parameters of the laser treatment. The laser beam was focused with a spot size of 0.2 mm and pulse energy of 15~30 mJ and the lines were scribed with a period of ~5 mm. The core loss was improved up to 15 % with Q-switched Nd:YAG laser in 3% SiFe, and the loss was relatively insensive to optical energy of the Q-switched pulse.

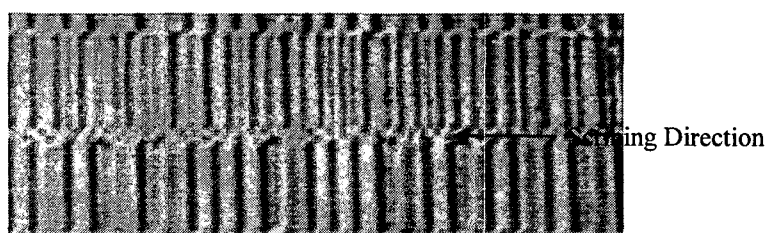


Fig. 1 Domain structure of 3 % SiFe after laser scribing.

References

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