§85. Magnetic Characteristics of Iron Core Materials at Room Temperature and 77K

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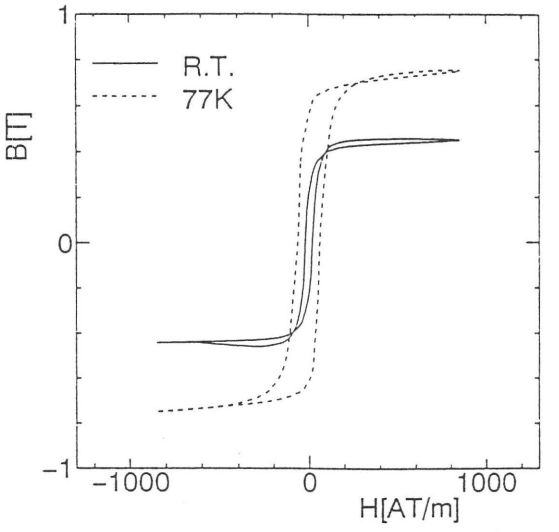
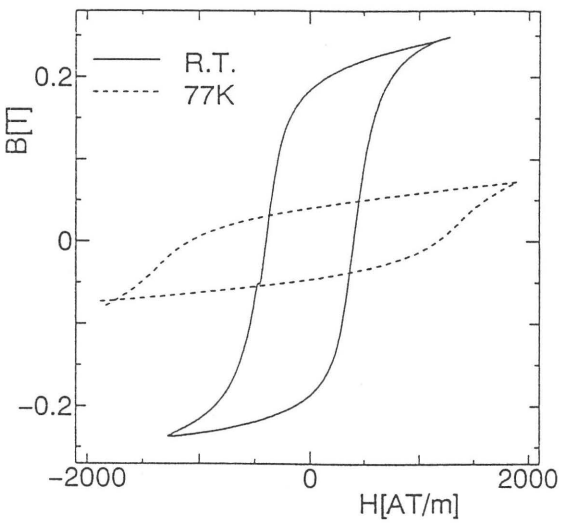
To restrict a current imbalance of strands such as cable-in-conduit-conductor (CICC), two kind of methods have been proposed. One is to insert a resistance in series for each strands. The other method is to use a ring type magnetic core material. The latter case, two strands are passed through an iron core and currents flow of these two strands are opposite direction so as to compensate the dispersion of inductance. The case of iron core method, magnetic characteristics of the core materials, that is B-H characteristics, may have changed by application temperature. So, we investigate the B-H characteristics of magnetic iron core materials at room temperature and at 77K. Investigated materials are four kind of ferrite core (H5C2, PC40, H5A, K6A) and 3 kind of metal core materials with high permeability (TMC-R, TMC-V, Sendelta). Where, H5C2, PC40 and H5A are Mn-Zn ferrite core and K6A is Ni-Zn ferrite core. On the other hand metal magnetic material is permalloy. Measurement was carried out under AC magnetized conditions.

Figure 1 shows the experimental results of ferrite core of H5A and K6A. And figure 2 shows metal material of Sendelta. Where, a solid line shows at room temperature characteristics and a broken line shows at 77K. Experimental results show as follows.

- Saturation magnetic flux density and coercive force of Mn-Zn materials such as H5C2, PC40, H5A increases at 77K However, K6A shows that the saturation magnetic flux density reduces suddenly at 77K.
- Metal core materials such as TMC-R, TMC-V, and Sendelta hardly change for temperature reduction.
- Magnetic core material with the highest value of saturation flux density at 77K is Sendelta and its value is 1.2T.



(a). H5A (50Hz)



(b). K6A (50Hz)

Fig. 1. B-H characteristics of ferrite cores

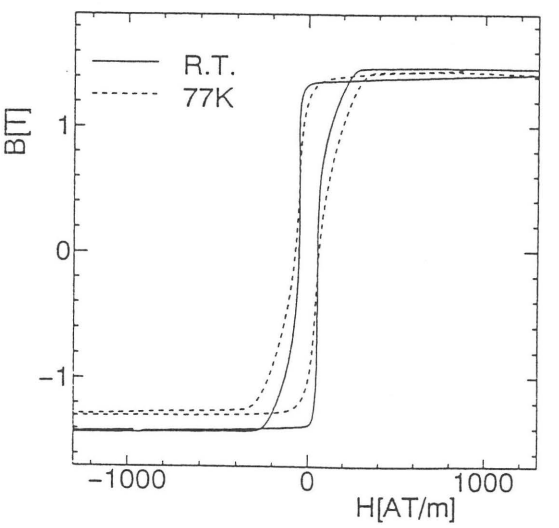


Fig. 2. B-H characteristics of Sendelta (50Hz)