

Study on Determination of Critical Temperature in Magnetization-temperature Curves

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Determination of the critical temperature via magnetic method has been studied for providing a standard. Various magnetization-temperature curves for NbTi, Nb₃Sn, and Bi-2223 wires were measured using a SQUID magnetometer and an ac susceptometer. The IEC (International Electrotechnical Commission), one of the international standardization organizations, issued an international standard on the definition of critical temperature by resistive method in 2002. In the standard the critical temperature is defined by a mid-point criterion in the resistance-temperature curve. Differently from the resistive method, the mid-point criterion can not be applied to the magnetic method because the magnetization-temperature curve does not show a sharp transition from normal to superconducting state as much as the resistance-temperature curve does.

Here, we applied the onset-temperature and the 1 % criteria with respect to diamagnetism to define critical temperatures for NbTi, Nb₃Sn and Bi-2223. We found that the critical temperatures determined by the 1 % criterion were fairly consistent with those obtained by the onset criterion. Finally, we confirmed that the critical temperatures defined by the magnetic and resistive methods agree in few percent.

keywords : superconductor, critical temperature, onset-temperature, NbTi, Nb₃Sn, Bi-2223