Lorentz-force Dependence of the Critical Current for SmBCO Coated Conductor

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Angular dependence of the critical current in a varying Lorentz-force configuration for a SmBCO coated conductor has been studied. Near the transition temperature, the angular dependence of the critical current in a varying Lorentz-force configuration was quite similar with the result of a constant Lorentz-force measurement. As the temperature is lowered and as the field is aligned along the *ab*-plane, the critical current measured in a varying Lorentz-force configuration becomes larger than the constant Lorentz-force measurement. We found that the field dependence of the critical current and *n*-value can be described by the same pinning model, the Kramer model including thermal activation, reported for constant Lorentz-force measurements of various *Re*BCO (*Re*, rare earth, Sm or Y) thin films [J. Appl. Phys. 102, 043904 (2007)]. As a possible reason, the Lorentz force acting on segments of twisted vortex lines due to collective pinning or by thermal excitations is discussed. It is further argued that the difference in the critical current for the varying and constant Lorentz-force measurements can be understood as mainly due to a variation in the pinning force, if we interpret the Lorentz force on twisted vortex lines as a scalar product between the applied field and current.

Keywords : *Re*BCO coated conductor, angular dependence of the critical current, the Lorentz force, he Kramer model