Effect of Dy2O3 on the phase formation and electrical properties of Tl-1223 HTS

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Anotation

Thallium-based superconducting compounds are one of the most important compounds among high-temperature superconductors. They possess a high critical current density and a high critical temperature for transition into the superconducting state, which allows their research and exploitation at temperatures higher than the nitrogen liquefaction temperature. Thallium-based high-temperature compounds are relatively newly discovered compounds. Besides determining optimal synthesis procedures and replacing chemical methods of obtaining them with traditional physical methods, the main task of scientists is also to raise the critical temperature of the superconductors' transition into the superconducting state and to increase the critical current density. One of the most important ways to achieve these objectives is to add dopants to the precursor. The correct selection of dopants and their addition to the precursor in the right concentration increases the probability of the formation of Cooper pairs and also leads to current stabilization. As a result, doped samples are characterized by higher critical temperature and critical current values. In the research process, dysprosium sesquioxide, an element from the lanthanide family, was selected as a dopant. A two-step solid-state reaction method was chosen as the method for synthesizing the precursor and the subsequent superconducting compound. The synthesized superconductor was subjected to X-ray phase analysis and magnetic susceptibility studies, which determined the physical properties of the sample. Final studies have shown that the addition of a specific concentration of dysprosium sesquioxide increased the critical current value without reducing the critical temperature of the superconductor.