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Streszczenie rozprawy doktorskiej w języku angielskim:

„Thermal fluctuations in high-temperature superconductors”

This PhD thesis focuses on the synthesis and characterization of thallium cuprates,  $Tl_2Ba_2Ca_2Cu_3O_x$  (Tl-2223), also doped with ferromagnetic elements (Co, Ni, Gd). The main objectives were to optimize the synthesis process and investigate the superconducting properties of the materials. The optimization process included the determination of the optimal conditions for the precursors preparation, synthesis conditions as well as the post-synthesis treatment. Each step required structural characterization using XRD and SEM but also employing various techniques such as AC susceptibility, resistivity, magnetization, magnetoresistance, and in some cases specific heat measurements to determine the critical temperature ( $T_c$ ) and critical current density ( $j_c$ ). Furthermore, critical exponents and system dimensionality were calculated, providing insights into the behaviour of the samples close to and away from  $T_c$ . While bulk Tl-2223 exhibit three-dimensional (3D) behaviour close to  $T_c$ , further from  $T_c$ , the system transitions to a two-dimensional (2D) behaviour. The calculated critical exponents for the doped samples indicate that the dimension of the system is 3D close to  $T_c$ , however, becomes undeterminable away from  $T_c$ . The general conclusion of the thesis is that superconductivity in the cuprates may be a 3D phenomenon, despite the clearly 2D crystallographic structure of these compounds.

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