EXPERIMENTAL AND THEORETICAL INVESTIGATION ON HIGH-T_C SUPERCONDUCTING INTRINSIC JOSEPHSON JUNCTIONS

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Within the last years many groups have realized and investigated different types of intrinsic Josephson junction (IJJ) arrays out of high-temperature superconducting single crystals or thin films. A short overview on the international status and results will be given.

We tried to improve the synchronization between the junctions by external shunts [1]. Mesa structures as well as microbridges on vicinal cut substrates showed multi-branch behaviour in their IV characteristics and random switching between branches [2]. Theoretical modelling was done investigating phase dynamics and stability numerically as well as analytically. Branch structure in current voltage characteristics of IJJ is studied in the framework of different models, particularly, in capacitevely coupled Josephson junctions (CCJJ) model and CCJJ model with diffusion current. We demonstrated that the inclusion of diffusion current might restore the equidistance of the branch structure [3]. The influence of microwave irradiation power on IV characteristics of IJJ is investigated [4]. We explained the experimental results by the competition between the "current effect" and the effect of suppression of the switching current by irradiation. Results of modelling of return current in IV characteristics for stacks with different number of IJJ are presented [5]. We discussed the possible mechanisms of synchronization and the ranges of stability [6]. Conclusions with respect to application of such arrays such as radiation sources were given [7].

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