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the main Shapiro steps are found at Vn= nhf/2e, where f is the frequency of the applied microwaves. The results were discussed in terms of the existing s-wave and dx2-y2-wave symmetry theories. *This work is supported by the Nation Science Council of ROC under Grand Nos. NSC87-2112-M-003-001 ,NSC87-2112-M-003-008

ETC-10

Inelastic resonance tunneling in S-Sm-S tunnel structures

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Inelastic resonant tunneling via localized states (LS) in an amorphous interlayer located between superconducting banks with s- and d-wave symmetry of the order parameters is studied theoretically. The developed theoretical model is applied to the description of high Josephson junctions with semiconductor oxide interlayers. It has been shown that in the case of s-wave pairing the form of the current-voltage characteristics and temperature dependence of zero bias conductivity does not fit the existing experimental data, which is consistent with the dependencies following from Glazman-Matveev theory for N-Sm-N structures. In d-wave pairing scenario the situation is changed due to reconstruction of BSC density of states N(e) at Sm/S interfaces. At the specular boundaries characterized by finite transparency this reconstruction occurs due to the presence of the Andreev bound states in the vicinity of the interfaces. The rough boundaries are modelled by means of a surface layer with small electronic mean free path. In this case the proximity effect with the bulk d-wave superconductor results in generating an gapless s-wave component localized near the boundary. The influence of these effects on the I-V characteristic and zero bias conductance have been studied. The results are compared with the experimental data.

ETC-11

Mechanics of High Temerature Suerconductive Josephson Junctions*

Parinov, I.A

It is natural to classify HTS Josephson junctions (JJs) into following three classes (i) junctions without interfaces where the weak coupling is caused by local degradation of the superconductive properties of HTS thin film microbridge due to electron or ion beam irradiation, (ii) junctions with intrinsic barriers or interfaces which are formed by different grain boundary JJs, and (iii) junctions with extrinsic interfaces in fabrication of which artificial normal metallic or insulating barriers are used. The latter JJs for HTS are most slightly studied in the present time. Usually, an effective superconductive area of the junction is smaller than the geometrical one. This is explained by microdefects appearance in these composite (particularly, layered) structures. The microstructural destructions are caused by some causes, namely, deformation (lattice cell) mismatches, thermal expansion anisotropy, exceeding of the film critical thickness, misorientation effects, interfaces roughness, etc. An especial attention it is demanded for study of mechanical and strength properties of the "ceramic-ceramic" and "ceramic-metal" interfaces. All above problems are investigated in this report with development of corresponding analytical and computer models. The numerical results are found by the junction geometry, physical and mechanical properties of layers, residual and applied mechanical loadings. *Work supported by the Russian MOPO in the Fundamental Research for Transport Sciences.

ETC-12

Magnetic Field Splitting of the Quasiparticle States in Planar Nd-Ba-Cu-O (123) / Pr-Ba-Cu-O (123) / Nd-Ba-Cu-O (123) Junctions*

Alvarez, G.A Utagawa, T Enomoto, Y Tanabe, K

We report on high quality planar junctions fabricated from well characterized c-axis quasi-homoepitaxial neodymium-barium-copper (1,2,3) / praseodymium-barium-copper (123) / neodymium-barium-copper (123) (NBCO/PBCO/NBCO) multilayers. C-axis tunneling spectroscopy investigations provide evidence of quasiparticle tunneling that is commonly observed for superconductor-insulator-superconductor (SIS) junctions. The tunneling conductance dI/dV of the junctions in parallel magnetic field reveals an anomalous splitting of the superconducting quasiparticle density of states. The magnitude of the splitting was found to be proportional to 2_mu_H and may be related to the magnetic moment of the quasiparticles. We compare the observed tunneling conductance with relevant theories. *This work was supported by NEDO

ETC-13

Flux Motion in YBCO Biepitaxial Josephson Junctions

Sung, H.H Yang, S.Y Horng, H.E Yang, H.C

We have measured the current-voltage characteristics of YBCO biepitaxial Josephson junctions under the magnetic fields. The field-dependent critical current was studied to afford information about the static behavior of Josephson fluxons in the grain-boundary junctions. Since fluxons transferred when the bias current was larger than the critical current, the fluxon dynamics was investigated from the current-voltage characteristics. Finally, the correlation between fluxon behavior and junction defects was examined. All the results will be discussed. *Supported by the National Science Council of ROC under Grant Nos. NSC87-2112-M-212-001, NSC87-2112-M-003-001 and NSC87-2112-M-002-002.

ETD JJ Arrays I

ETD-01

Propagating Waves in Discrete Josephson Oscillator Arrays with Loads

TRIAS, E DUWEL, A.E ORLANDO, T.P WATANABE, S STROGATZ, S.H

Experiments, simulations and analysis were performed on a broad range of discrete arrays of Josephson-junction oscillators in order to understand their ability to produce coherent radiation. Networks ranging from single square and triangular plaquettes to one- and two-dimensional arrays are studied. In each array, the junctions are identical and underdamped, and the arrays are driven by dc bias currents. Although few analytical results are known for these systems, we study the technically interesting solutions which can be represented as traveling waves. It is in this mode that the devices can be used as submillimeter wave sources. Using the mathematical technique of harmonic balance it is possible to create an equivalent linear circuit of a Josephson network that is operating in this traveling wave mode. An application of the circuit model is the study of the effect that the boundaries have on the traveling wave. The reflection and transmission properties have also been studied by adding a passive terminating load to the array, thereby making it possible to use circuit techniques to calculate the load impedance that will minimize the reflections.

ETD-02

Maximizing Microwave Power From Triangular Josephson Junction Arrays

Lin, N.C.H Yukon, S.P

It has previously been shown that coherent microwave power can be generated along the row junctions of a 2D triangular Josephson junction array when operated at f=1/2. For large arrays (> 6x6) there is a tendency for the array to shift from the dynamic checkerboard state where maximum power is developed, into more dynamically stable states. For the simplest 2 row array these are: the shifted checkerboard state, where there is a small phase shift in the circulating