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a mixture of argon and 5% oxygen at the substrate temperatures of 700-720°C in 15 minutes before deposition of the superconducting counter electrodes. Critical current densities depend on the gas pressure ranging from 0.004 to 40 Pa and are controlled to be 3 k-100 kA/square-cm at 4.2K and 0.6-600 kA/square-cm at 40K. All the junctions exhibit RSJ-like current-voltage (I-V) characteristics. Hysteresis can be observed in the I-V curves for the junctions with low critical current densities. Most of the junctions with low critical densities show Prannelher-like modulation patterns for an external magnetic field with the modulation depth of 10% at 4.2K, while the junctions having high critical current densities behave as a large junction. The junction resistance is almost independent of temperature, suggesting that direct or resonant tunneling is the dominant transport channel for quasi-particles as well as in the bicrystal junctions. The characteristic voltages of the junctions are around 10eV, though the characteristic voltage tends to be slightly high in the junctions having high critical current densities.

**EIB-02**

**Fabrication of YBCO-Ramp-Type Junctions by Interface Treatment**


We have investigated ramp-type junctions with barriers fabricated by interface treatment, instead of heteroepitaxial growth of barrier layers, similar to the approach of Morony et al. [1]. In our approach, YBCO ramps were formed by Ar ions in a Kaufman-type source and subsequently annealed. As shown by TED investigations of Jia et al. [2], a non-superconducting cation-disordered cubic phase can crystallize at an interface which is amorphized by ion beam etching. The high resistance characteristics of our junctions, as well as the power dependence of the step height of Shpock steps can be well described by the RSJ model. The critical current density is 10 kA per square cm, and the critical voltage is 0.5 mV at T=77K. A nearly perfect Prannelher pattern indicates the formation of a homogeneous barrier layer at the interface. The temperature dependence of critical current and normal resistance suggests a metallic character of the interface layer. The influence of etching parameters and annealing conditions on the properties of the junctions will be presented and discussed, also in terms of the results of continuing TEM investigations. [1] R. H, Morony, A. C, Shpock, Appl. Phys. Lett. 41, 2569 (1991) [2] C.L, Jaa, M. I, Falty, U. Pepe, K. Urban, Appl. Phys. Lett. 67, 3035 (1995)

**EIB-03**

**Interface-engineered high-Tc Josephson Junctions - how they work**

**Takahashi, J, S**

Recently very interesting results were reported on fabrication of high-Tc Josephson junctions in thin film ramp edge geometry, where no deposited interlayer was employed. These junctions have stable RSJ-like I-V characteristics, well reproducible and stable. However the nature of the Josephson effect in these devices is not well understood. We show here that the Josephson effect in these devices can be described quite well with our old idea for fabrication of High-Tc Sn-N Josephson junctions by material modification. During the fabrication process the same effect takes place similar to the e-beam written or oxygen ion modified weak links - a depression in the transition temperature due to the induced particle damage. But in the ramp geometry it is possible to create a normal conducting barrier only few unit cell long. The critical temperature depth profile of the modified film was calculated including the temperature anisotropy, which happens during the deposition of the second YBCO layer.

**EIB-04**

**Low Frequency Noise Studies of YBCO Interface Engineered and SNS Josephson Junctions**


The low frequency noise behavior of high temperature superconductor Josephson junctions can yield useful insights into the nature of the different types of junction technology. The origin of such noise has variously been attributed to metastable basal plane oxygen defects whose fluctuations can modulate both the critical current and the normal state resistance of a superconductor, or normal metal, weak link contact, or to electron trap states in a tunnel barrier whose slowly fluctuating occupancy can modulate the tunneling barrier. In this study the 1/f noise of interface engineered YBCO edge junctions has been measured, as well as that of SNS YBCO junctions that employ Co-doped YBCO as the N-layer. In the latter case several different fabrication protocols have been used, which have resulted in substantially different levels of normal-state junction conductance and critical current density. We will present the results of these measurements, compare the noise levels of these junctions with those of grain boundary junctions, and discuss the implications of these results for better understanding the origin of the Josephson junction behavior arising from these different junction technologies.

**EIB-05**

**Properties of Rough Interfaces in Superconductors with D-Wave Pairing**

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Theoretical model of a rough interface in a superconductor with d-wave symmetry of the order parameter is proposed. We argue that the model is relevant for the description of HTS junctions. The surface roughness is introduced by means of a surface layer with small electronic mean free path. The proximity effect between such a layer and a bulk d-wave superconductor is treated theoretically in the framework of the quasiclassical Eliashberg theory. It is shown that as a result of strong scattering in the interlayer the d-wave component of the order parameter near the interface is reduced while the s-wave component localized near the interface is generated. Angular and spatial structure of the pair potential and the electronic density of states near the interface is calculated. The role of the zero-energy (midgap) and finite-energy bound states tends to peculiarities in the energy dependence of the angle-averaged density of states. In the framework of this approach the Josephson critical current is calculated for a number of junctions based on d-wave superconductors: Sc,Si microconnection, SIS tunnel junction and SNS junction having a normal interlayer with small mean free path.

**EIB-06**

**Fabrication of YBaCuO Wiring for YBaCuO Tri-layer Junctions**

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From the point of view of the HTS integrated circuits, it is very important to fabricate tri-layer junctions with the reproducibility of junction parameters and the HTS wiring. We have demonstrated the reproducibility of YBaCuO/YBaCuO/YBaCuO YBaCuO trilayer junctions with Au wiring layer. Two junction samples with the PbBaCuO barrier of 0.35 mm on different substrates showed the RSJ-like current-voltage characteristics with different values of the Jc of 17 A/cm2 and 1.7 A/cm2. We have fabricated YBaCuO films with a CeO2 insulating film on a (110) SrTiO3 substrate. Since CeO2 oriented YBaCuO films are suitable for wiring layer by taking account of an anisotropy of superconducting properties, a 1080 oriented MgO buffer layer was introduced between the substrate and the CeO2 insulating film. The YBaCuO film had a Tc of 85 K. From these results, we have tried to fabricate YBaCuO trilayer junctions with the YBaCuO.