

barrier, which locally increase its transparency. For instance, it is known that dissociative chemisorption of H_2 takes place on aluminum oxide surface, resulting in formation of O-H and Al-H bonds which remain stable up to high temperatures under ultrahigh vacuum conditions. Adsorbed hydrogen affects also the structure and adhesion properties of the oxide surface [28]-[30]. With a TMP, the hydrogen pumping efficiency is almost the same as for N_2 , and there is no possibility of H_2 desorption from the pump. So the concentration of H_2 in the oxidation chamber is expected to be lower and hence lower is the concentration of H-related defects inside the oxide tunnel barrier and of O-H bonds at the interface with Nb counter electrode. The proposed explanation needs further examination by analytical methods.

V. CONCLUSION

By studying a set of 70 wafers, we have found that intrinsic stress in Nb/Al- AlO_x /Nb trilayers and comprising layers has no effect on the quality of Josephson junctions. We have found, however, a dramatic effect of the oxidation conditions on JJ quality (V_m): the use of a TMP-pumped oxidation chamber instead of a cryopumped chamber resulted in a factor of 2x increase of the average V_m of tunnel junctions and a factor of 6x improvement of run-to-run reproducibility. We attributed the found effect to differing degree of hydrogen chemisorption during and after AlO_x barrier formation by dynamic oxidation of aluminum in different chambers.

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