Cornell University
Laboratory for Elementary-Particle Physics

Temperature Map Studies on Nearly Oxide-Free, Thin-Oxide and Standard-Oxide Cavities

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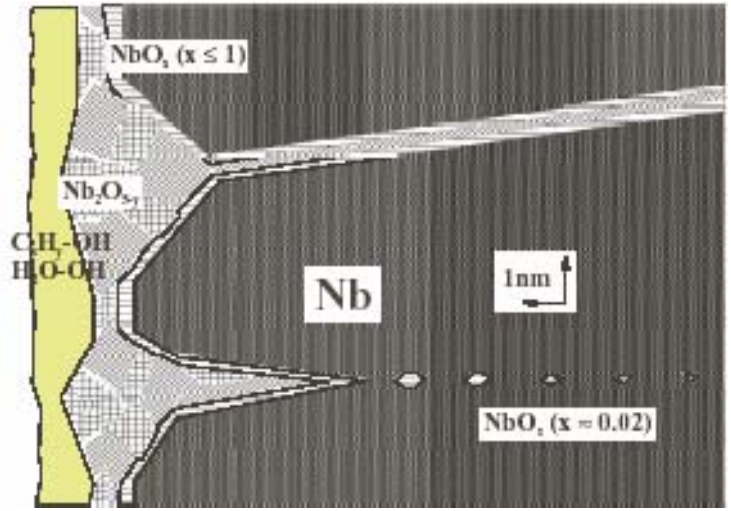
Motivation



Surface composition

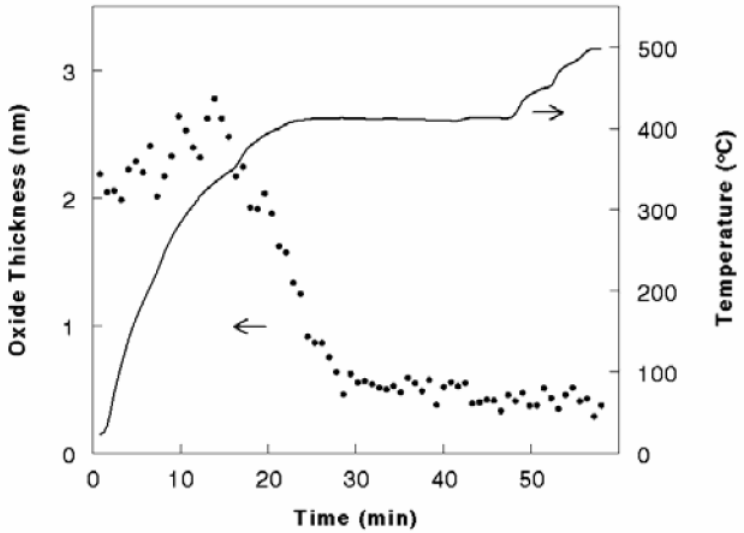


Figure 7. Sample #2, total oxygen core level peak vs. T. Peak intensities are measured above background

R. Kirby et al., SLAC-TN-05-049, 2005

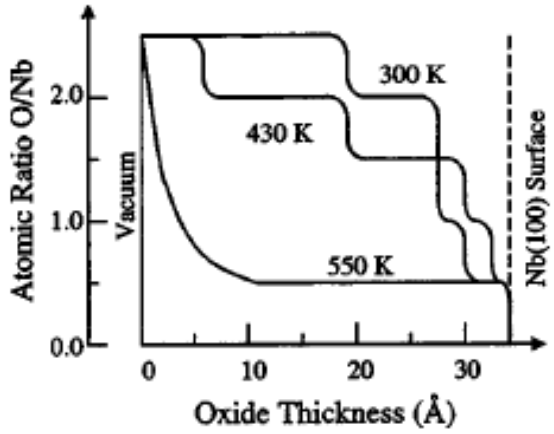
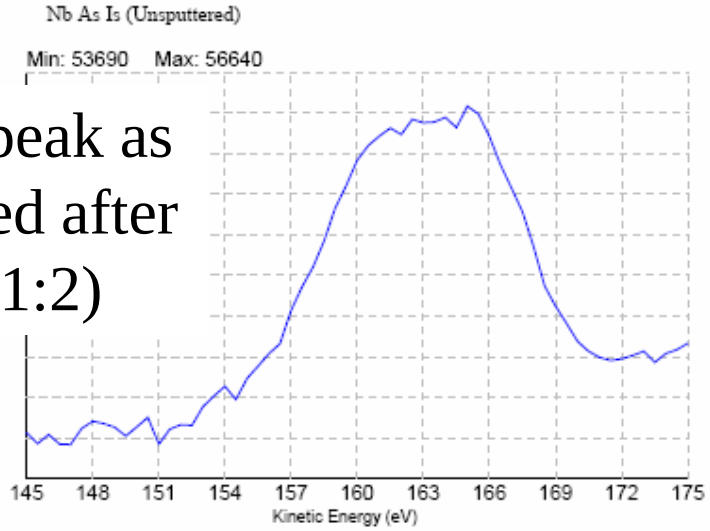


FIG. 5. Schematic for evolution of the oxide composition upon annealing at 430 and 550 K, respectively. The figure is presented from the vacuum/oxide interface to the Nb(100) surface as indicated.

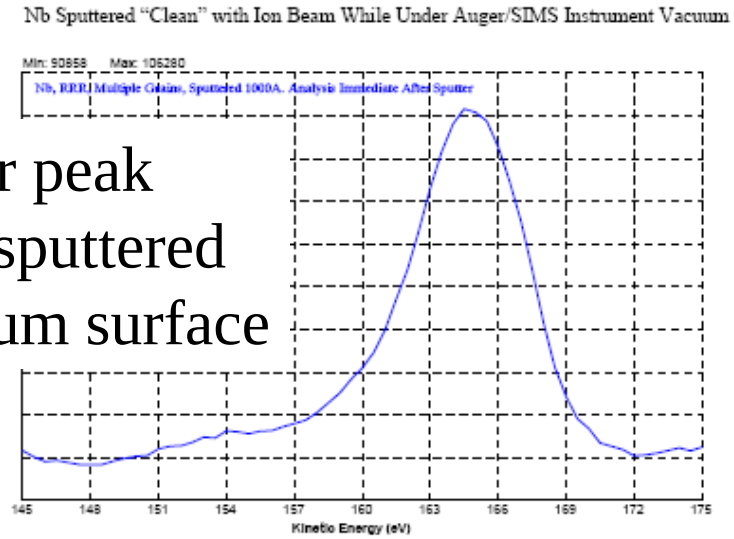
Q. Ma et al., JAP, 96, 12, 2004

Surface composition

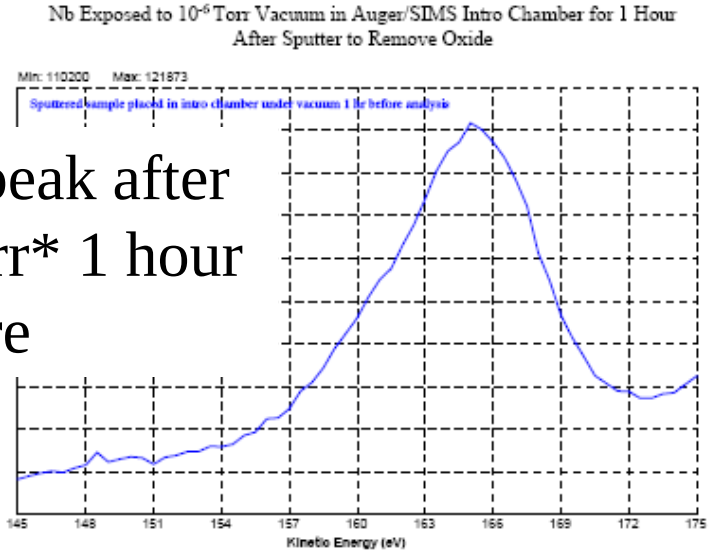
Auger peak as Received after BCP(1:1:2)



Auger peak for a sputtered niobium surface



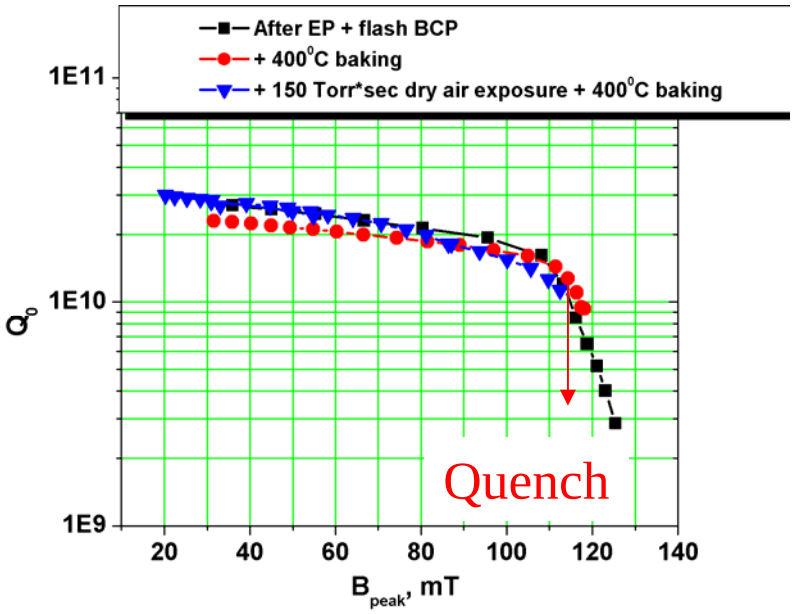
Auger peak after 10^{-6} Torr* 1 hour exposure

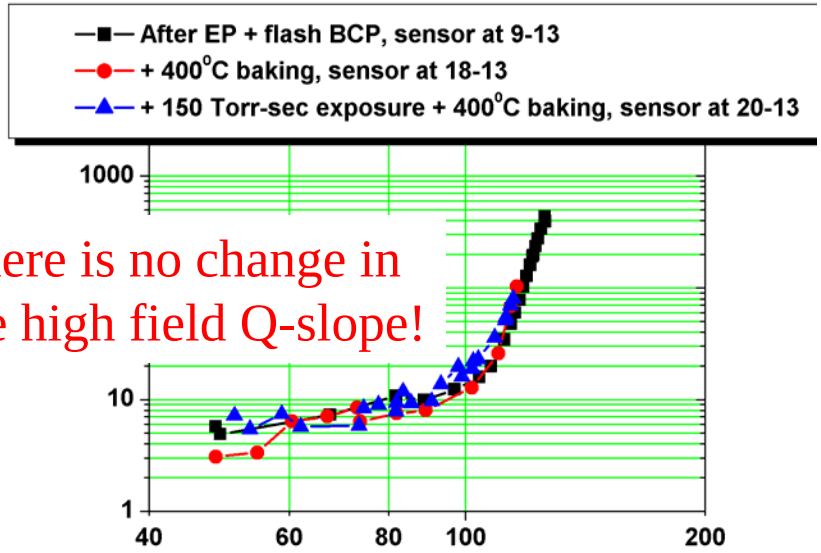


J. Kaufman et al., SRF, 2005

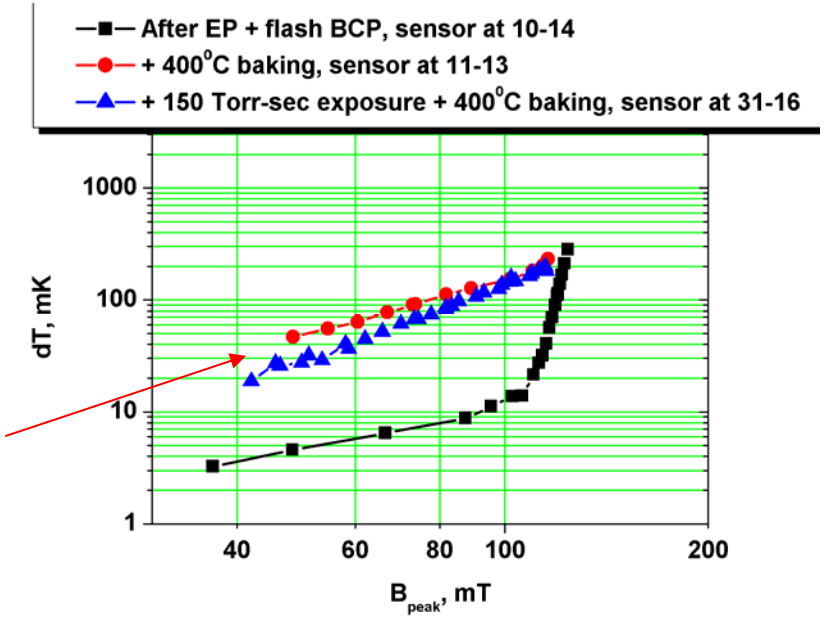
Effect of 400^{0}C baking

LE1-36, ~ 1-3 mm grain size,
VEP + flash BCP





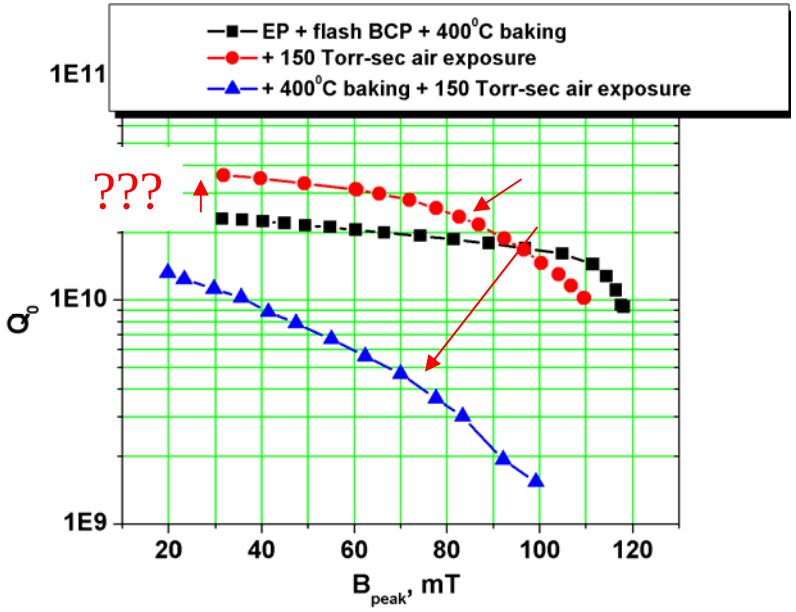
There is no change in
the high field Q-slope!

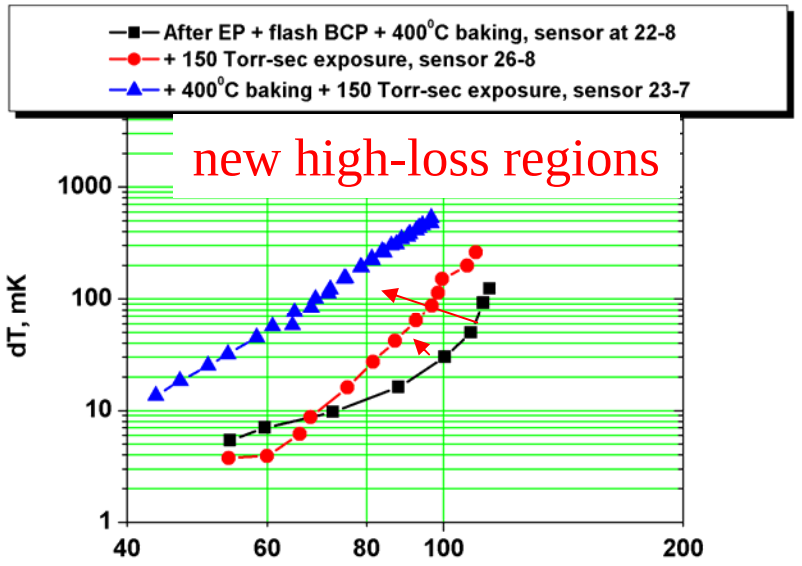


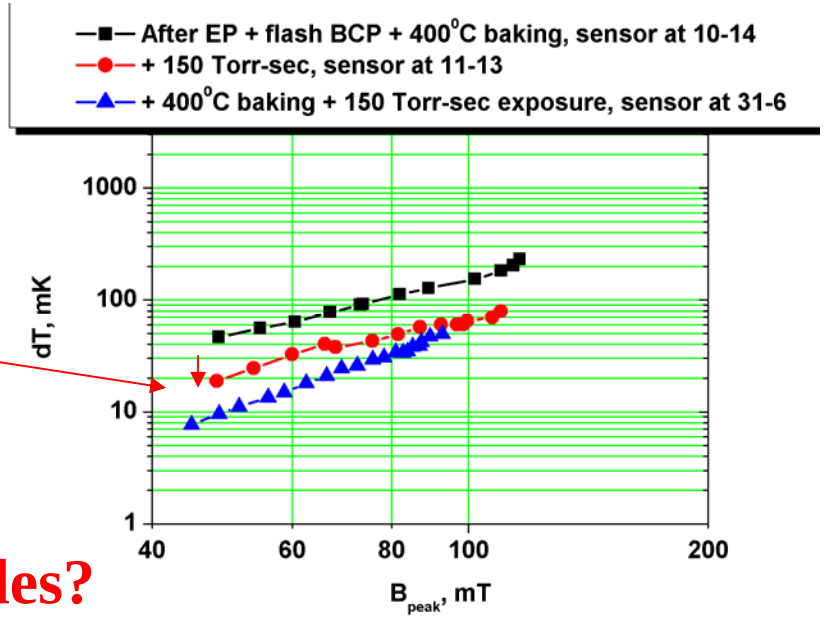
A few high resistance regions are
formed by 400^{0}C baking

Effect of short exposure

Short exposure causes
a strong medium field Q-slope





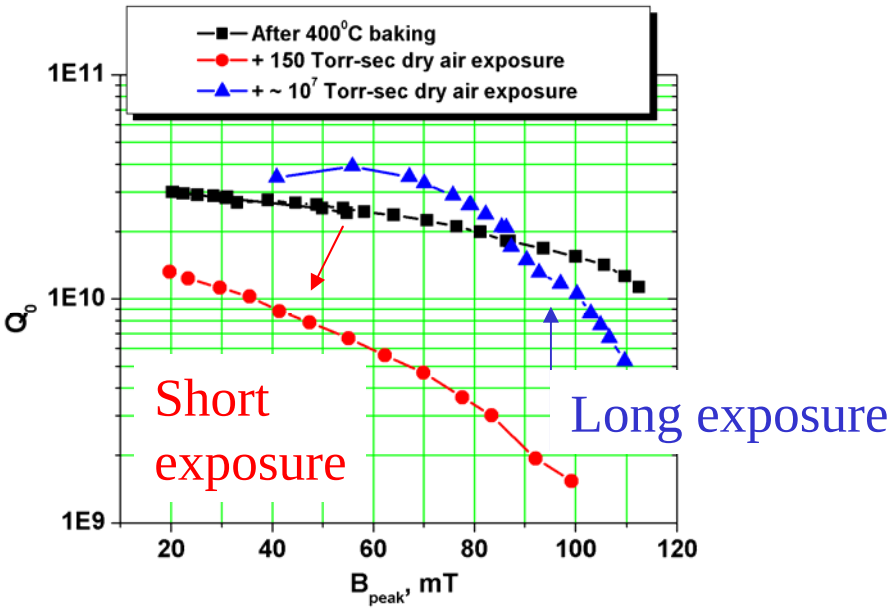


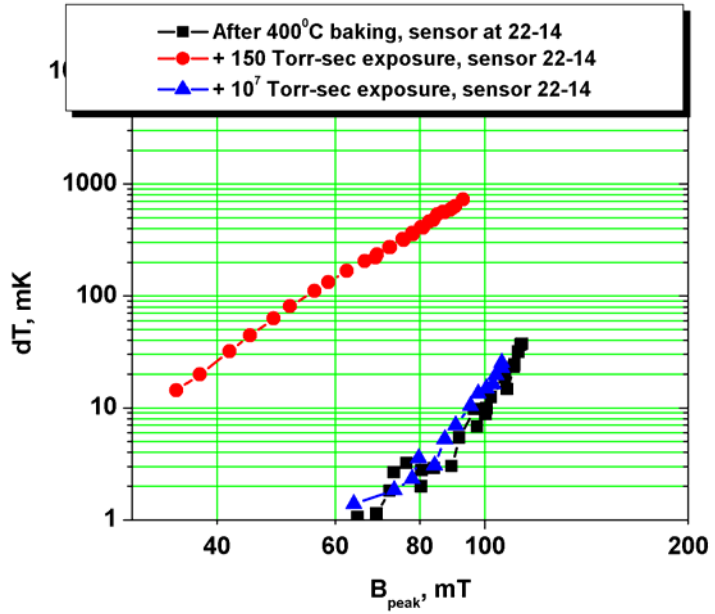
High quadratic loss regions, which appeared after 400°C baking, are improved by short exposure

Formation of high loss sub-oxides?

Effect of long exposure

Long exposure after a short one causes improvement in quality factor

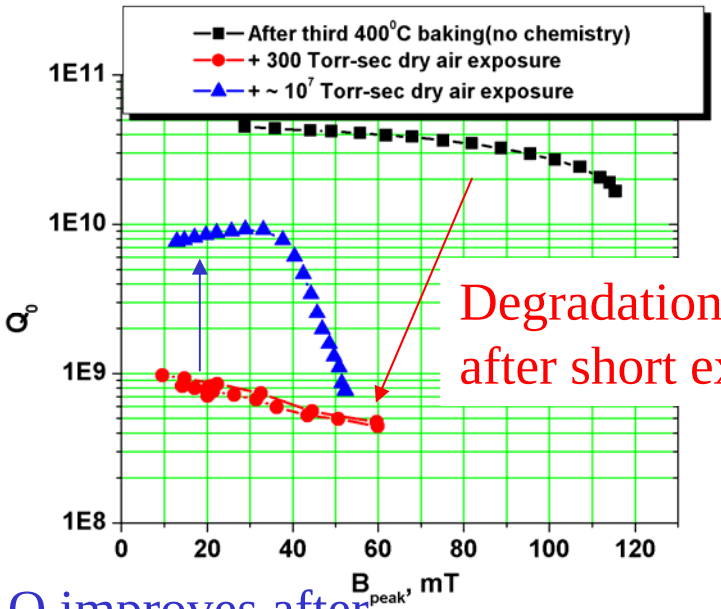




Conversion of sub-oxides to pentoxide?

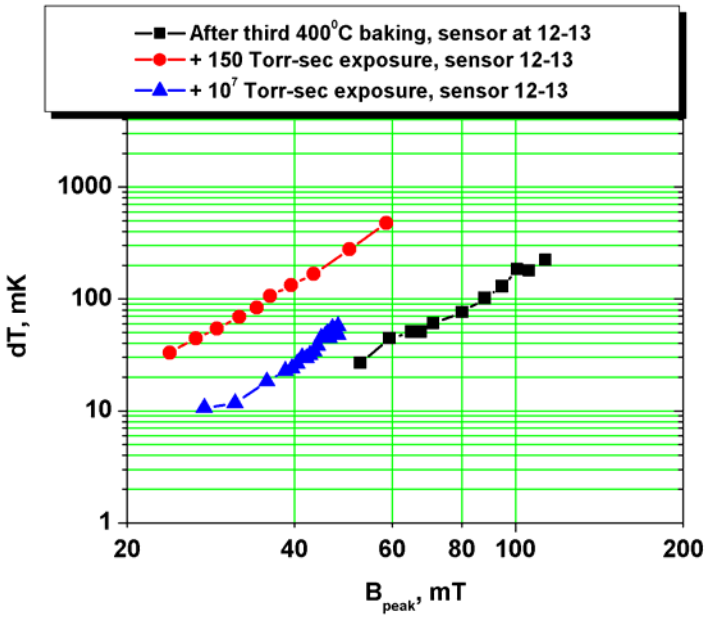
Latest Experiments

Third set of experiments, no chemistry



Degradation of Q after short exposure

Q improves after long exposure



Conclusion

Niobium surface after chemistry