SAND2017-12614C

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Low Temperature Properties of Ta_xN SNS Junctions

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Motivation:

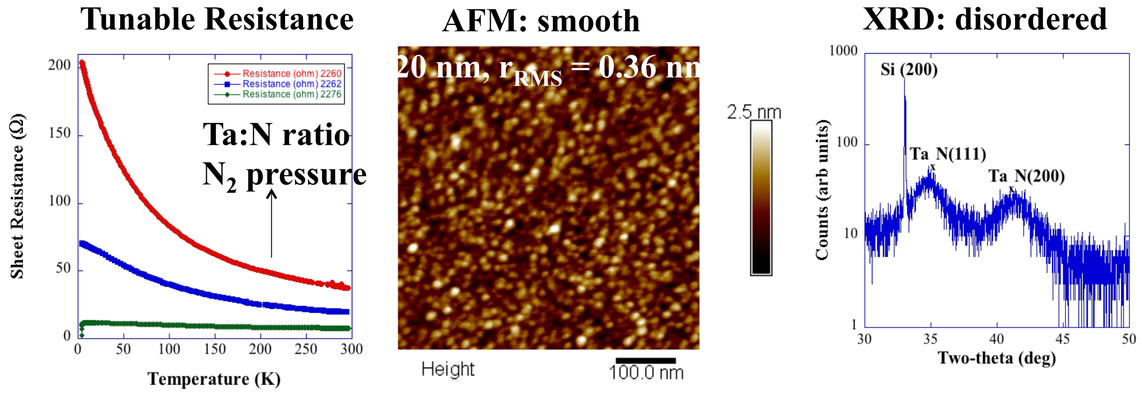
Can Ta_xN offer advantages over AlOx barriers?

- **Thermal stability – can use optimized dielectric, potential for 3D scaling**
- **Barrier properties can be tuned – self shunting, may be less susceptible to electronic defects**
- **High quality films and JJs previously demonstrated on crystalline substrates and/or with high temperature growth [1-14]**

Approach:

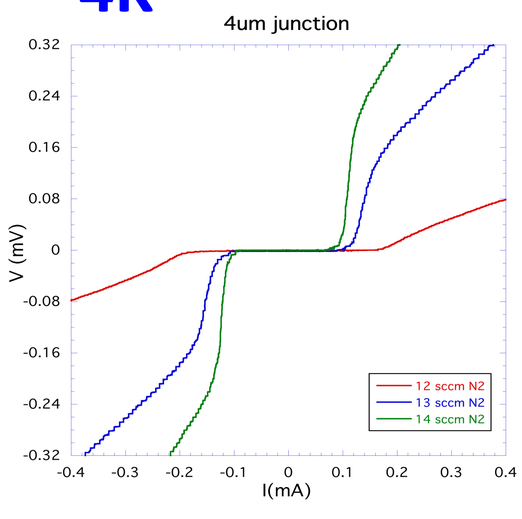
Explore Nb/Ta_xN/Nb JJs grown at *ambient temperature* on *SiO_2/Si* substrates (for future scaling) see M. D. Henry poster!

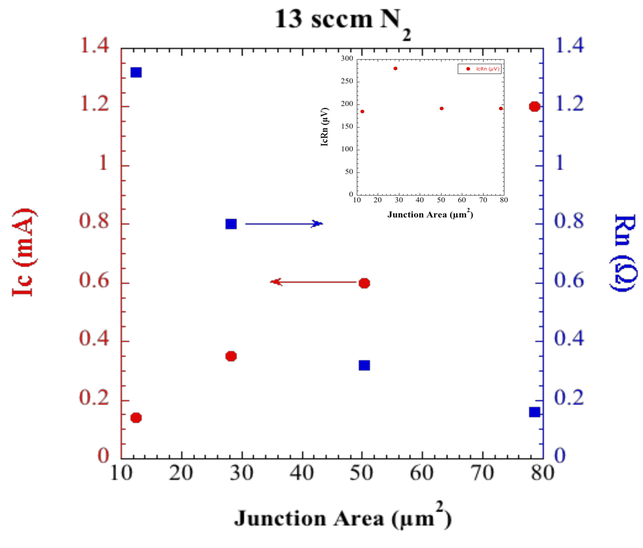
Single Ta_xN films on SiO_2/Si substrates are smooth, single phase and have tunable electronic properties



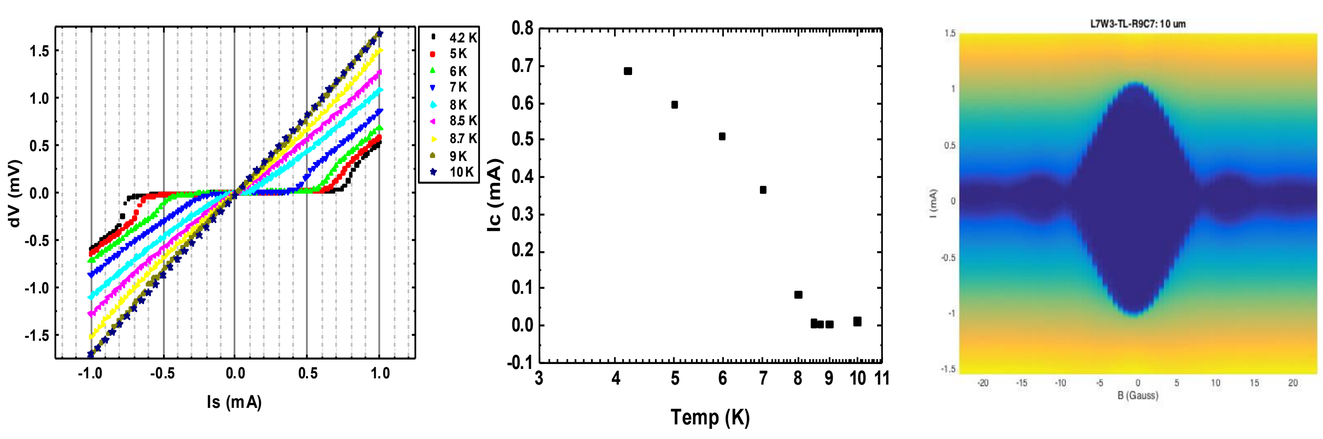
Low T Junction Properties:

4K





Temperature, Field Dependence



- I_cR_n products depend on both barrier thickness and N content
- I_cR_n products up to 0.35 mV have been achieved

Future Directions:

- Improved statistics to better understand dependence of properties on N content and thickness in order to increase I_cR_n – correlate with 300K resistance measurements
- Explore multiple JJ layers, processing temperature stability

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Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International, Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

This research is supported by the LDRD program at Sandia and the Office of the Director of National Intelligence (ODNI), Intelligence Advanced Research Projects Activity (IARPA). The views and conclusions contained herein are those of the authors and should not be interpreted as necessarily representing the official policies or endorsements, either expressed or implied, of the ODNI, IARPA, or the U.S. Government.
The authors thank M. Manheimer and D. S. Holmes for their support.