Universität Hamburg
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CHyN
Center for Hybrid Nanostructures

ATOMIC LAYER DEPOSITION (ALD)
SMART

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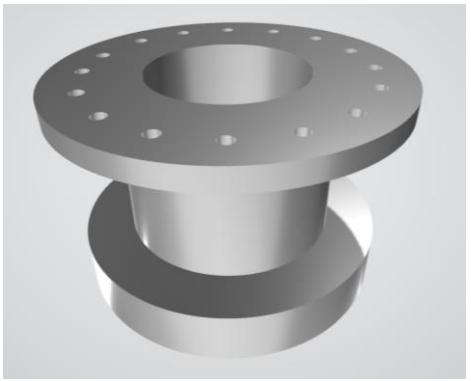
SKILLS ACQUISITION

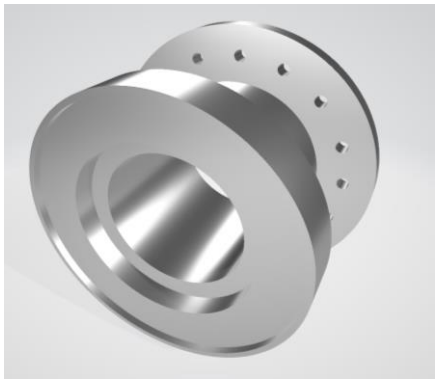
- ALD
- PEALD
- Ellipsometry
- PPMS DynaCool
- Four Point Probe Method
- AFM
- Clean Room
- Hydrofluoric Acid Safety Procedures

Next Step: Treatment Nb samples ⟶ EP and bake

ATOMIC LAYER DEPOSITION (ALD)

ALD system has no size limitation on samples → New ALD lid for QPR samples





- Warm up ALD systems
- Search and solve leaks

Coating

Four Probe

Resistance

Ellipsometry

Thickness

Van der Pauw Method

Resistivity

Wire Bondering

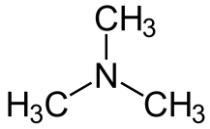
PPMS Quantum Design DynaCool

Low Temperature Transport Characterization

PLASMA ENHANCED ATOMIC LAYER DEPOSITION (PE-ALD)

TDMAT

TMA



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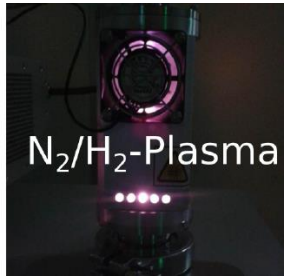

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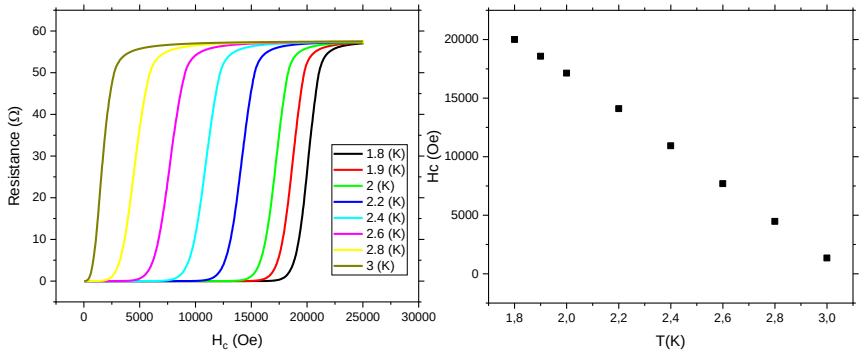
250 °C
300W
Ar purged Flow
200 mTorr

= AlNTiN → Ex Situ / In Situ

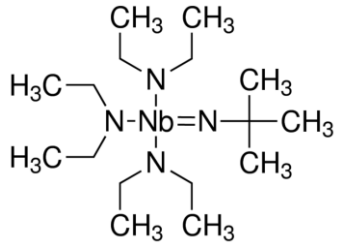


Increase Tc Tc(K)=2,53
Tc(K)=3,13
↑ 0,6 (K)

Decrease Resistivity R(μΩ·cm)=425,84
R(μΩ·cm)=175,94

PLASMA ENHANCED ATOMIC LAYER DEPOSITION (PE-ALD)

TBTDEN



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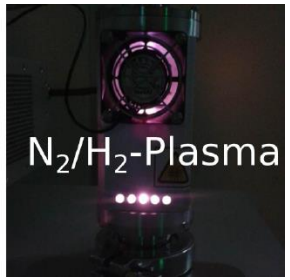

@

250 °C
300W
Ar purged Flow
200 mTorr

=

NbN

Precursor's Temperature

75 °C
85 °C
95 °C

→ NO DEPOSITION → TEMPERATURE INCREASE

FINAL CONCLUSIONS

- Coating NbN and TiNbN films. Characterization
- EP and Bake Nb samples
- Build the ALD's lid (modify design?)

THANK YOU FOR YOUR ATTENTION

QPR Fabrication

- **Waterjet-cutting** of some parts already started
- Final **step-file** with modified weld-geometries from Zanon **accepted**
- Expect final **drawings** by end mid-February
- Final release of production plan and QCP in next meeting
- Hold points after finishing of fabrication of major sub-components
- A set of **metrology measurements** at hold points to monitor and modify the exact pole shoe position in the QPR
- Leak test according to DESY spec **prior** shipping
- Delivery with blind flanges assembled (provided) under air pressure in provided transport box

QPR after Fabrication

Schedule and first commissioning

Fabrication time: 32 week, expect QPR at DESY ~**October 2020**

- No chemistry / heat treatment yet

Planned measurements

- Spectrum warm
- Spectrum cold? if insert is ready
- Mechanical resonances (Usage of geophone)

Surface treatment (external – E.Z. most likely)

- Coarse BCP (>130µm)
- 800°C/3h or 650°C/10h
- Fine BCP (20-40µm)
- 120°C/48h

QPR Sample A3

On-loan from HZB

- 5 full samples fabricated at RI for HZB
  - Used LG for top
  - Surface was treated at RI with grinding paper P800+ BCP 150mu + 800C + BCP10mu
- Surface still looked bad (image)
- We prepared EP @ Henkel
  - First run Dec.2019: They used a different mixture than specified (no HF but Sulfonic Acid)
  - Overall roughness improved but a lot of bumps
  - Jlab sample looks unusual after EP as well
  - Plan:
    - Re-treat with correct mixture
    - Use Nb samples to see how this other mixture affects composition