Task 4.3: Mitigate beam-induced vacuum effects

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Science & Technology Facilities Council

NEG coating studies

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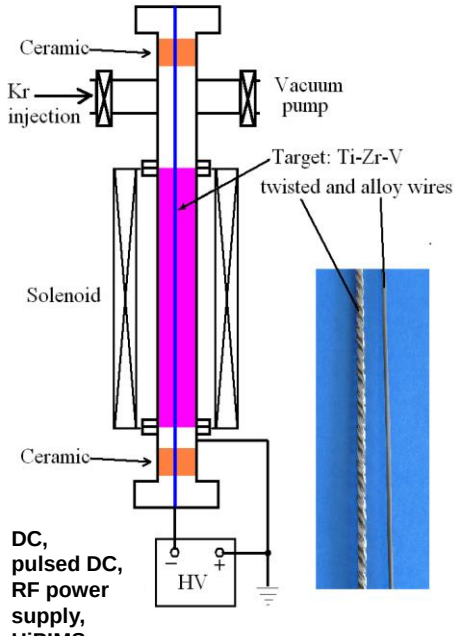
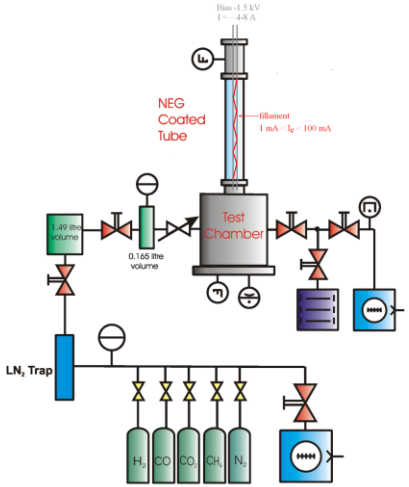
NEG coating studies

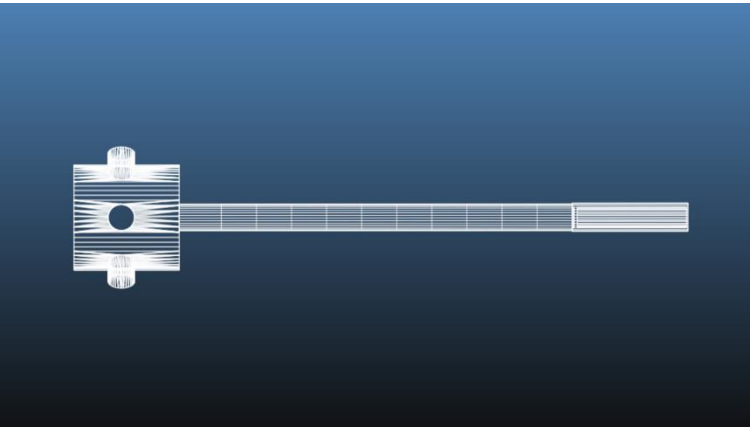


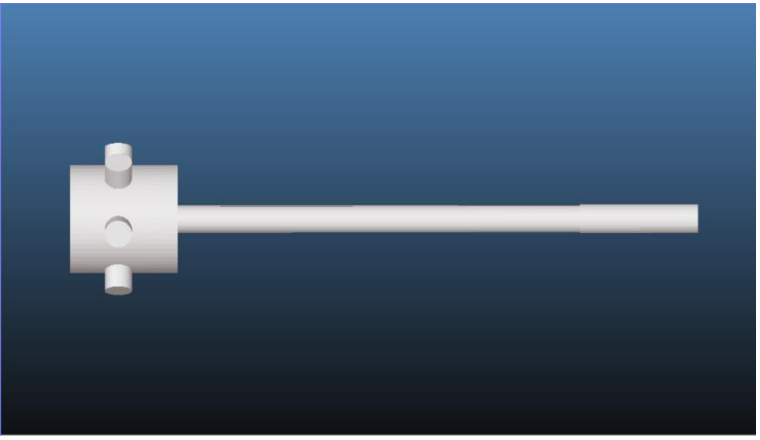
DC, pulsed DC, RF power supply,

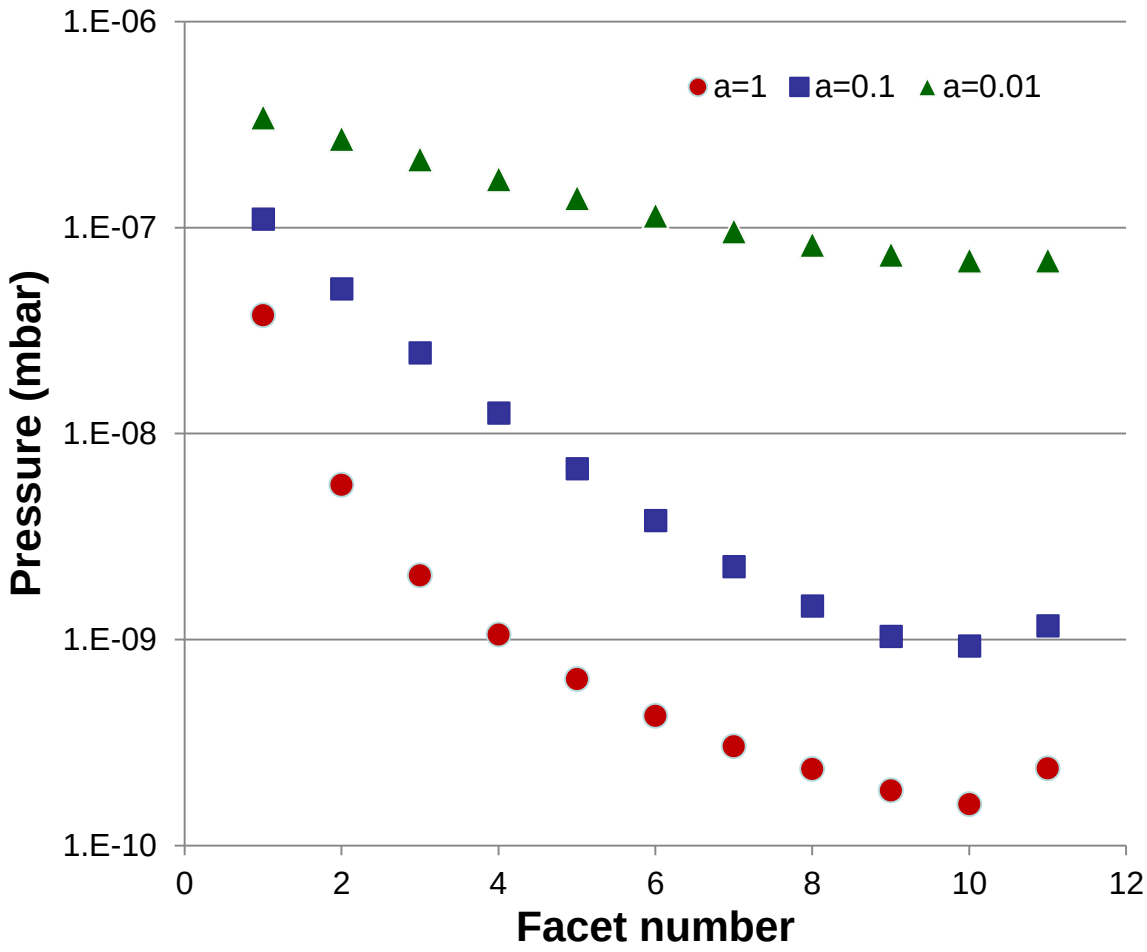


- Current work:
  - MOLFLOW modelling of the test facility - completed
  - Deposition of Zr on a sample tube, ESD and pumping measurements
    - Sample 1 (dense film) – measurements are completed, data analysis in progress
    - Sample 2 (dense film) – measurements are completed, data analysis in progress
    - Sample 3 (columnar film) – pumping property measurements are completed, ESD measurements have started
- Next Steps:
  - Modifying a facility for measurements with LN_2
  - Ti-Zr-Hf-V film to be deposited and measured at temperatures between room temperature and LN_2
  - Design of a facility for cryogenic (dry system 4 K < T < 80 K) measurements
  - Analysis of the experimental results
- Showstoppers
  - None at this stage

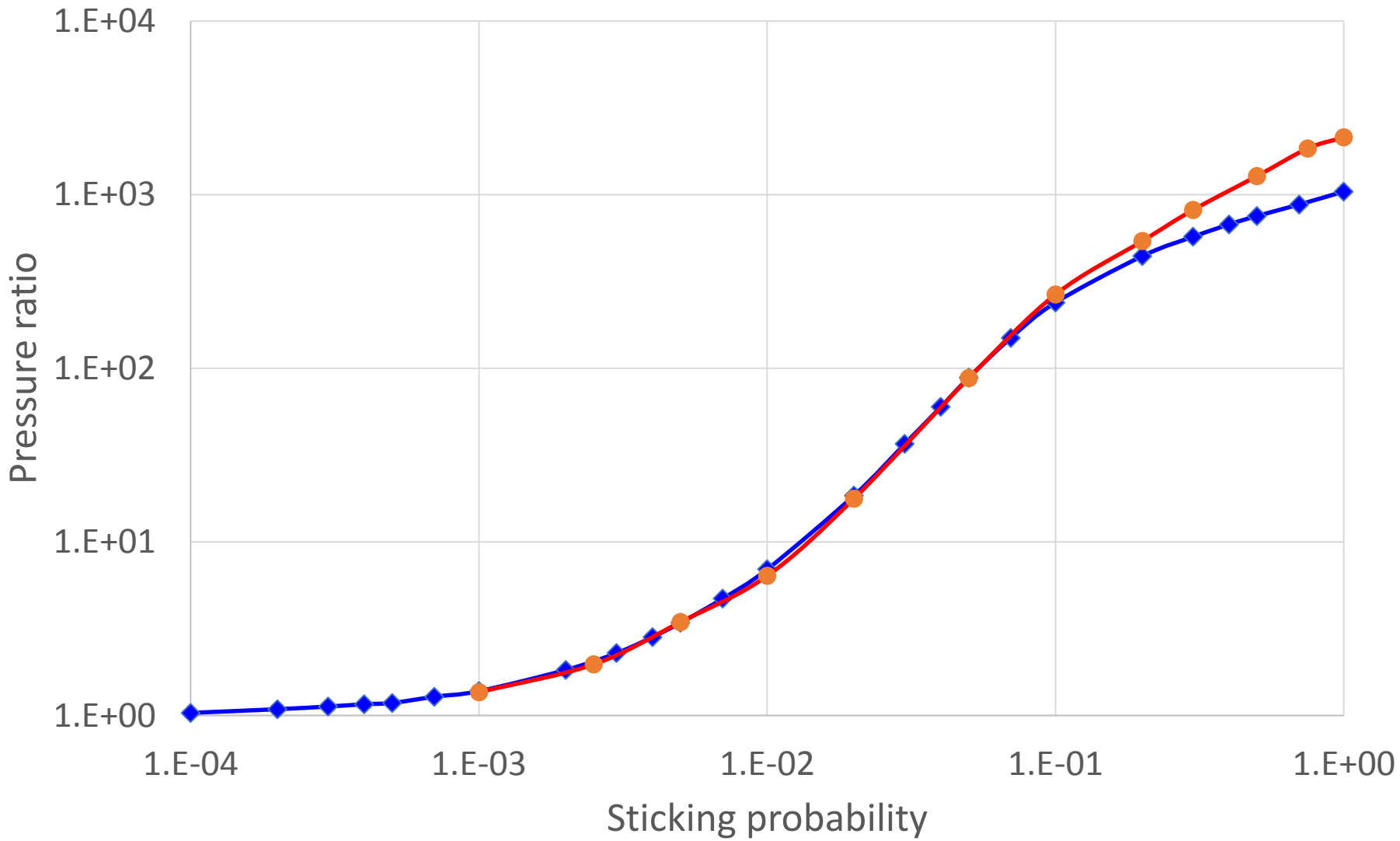
MOLFLOW modelling of the test facility



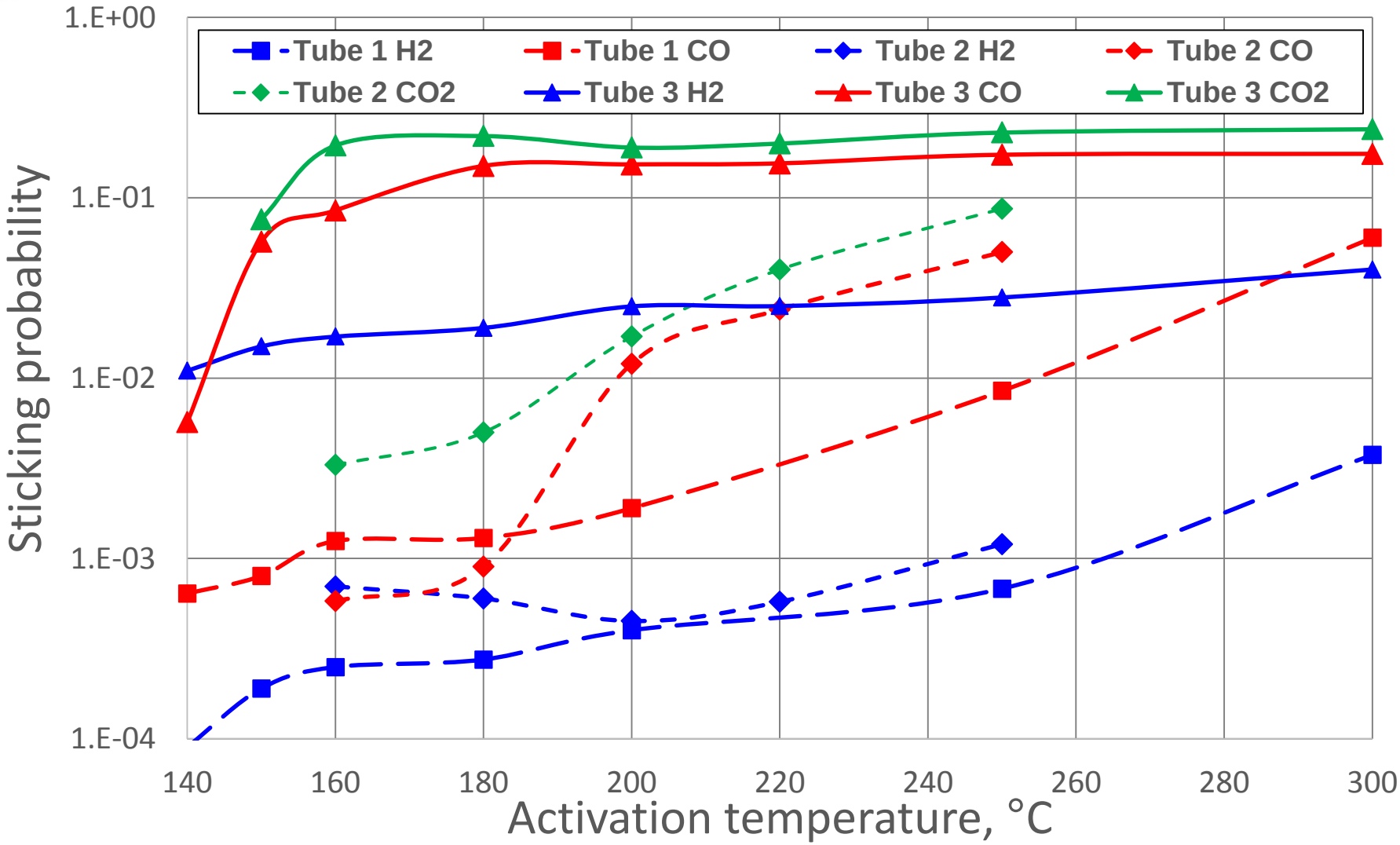




Modelled pressure ratio vs. sticking probability



Samples 1&2 - dense Zr, sample 3 - columnar Zr



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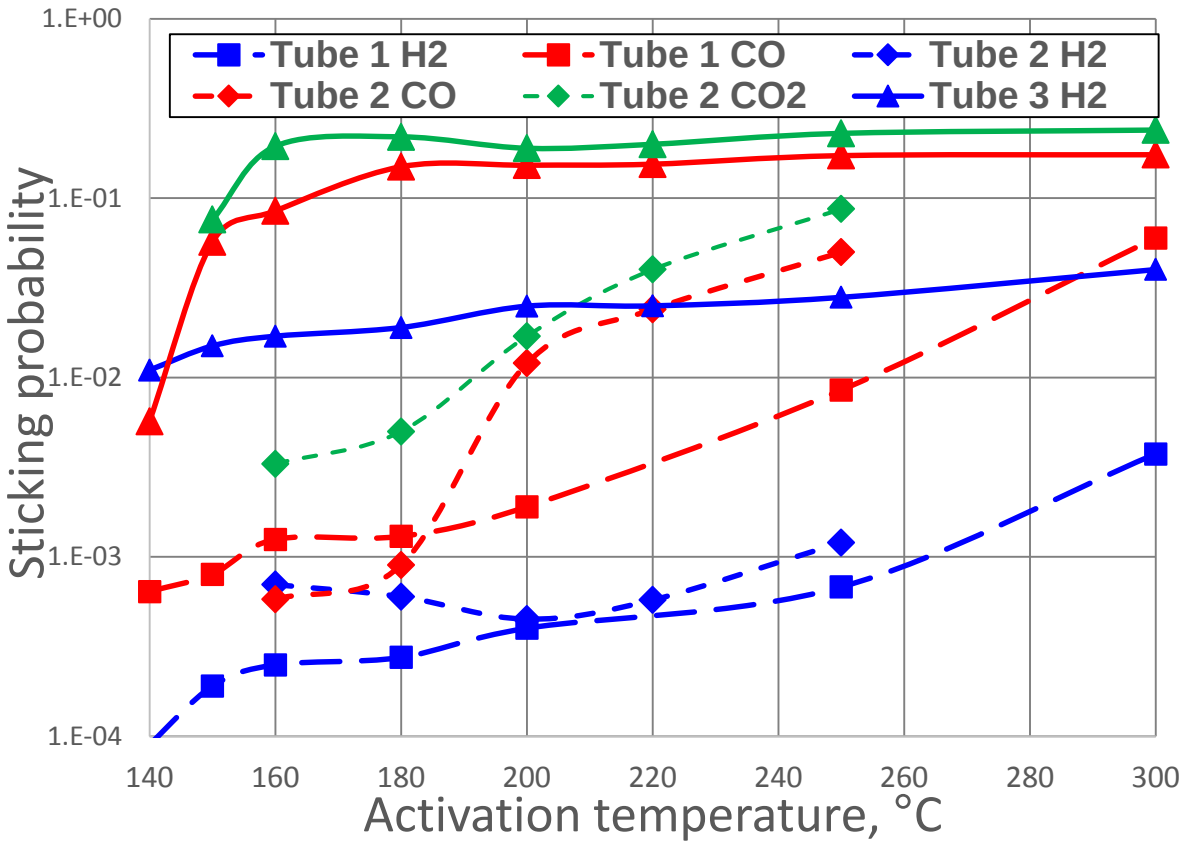

- Pure Zr coated tube with a columnar structure demonstrated good pumping properties after activation to 150°C.
- ESD - to be analysed

Next steps

- Data analysis
  - ESD data has not been analysed for any tubular samples
- Molflow simulations
  - Beam chamber used for ESD measurements has been modelled
  - Simulations run
  - Need to use matrix method for connection to experiments
- Measurements at room temperature
  - Third Zr tube (this time columnar) is being tested
  - Ti-Zr-Hf-V samples to be tested afterwards

Cryogenic temperatures

- The existing NEG characterisation facility will be upgraded for measurements at LN_2 temperatures
- For tests at liquid helium temperatures, a new system will be built