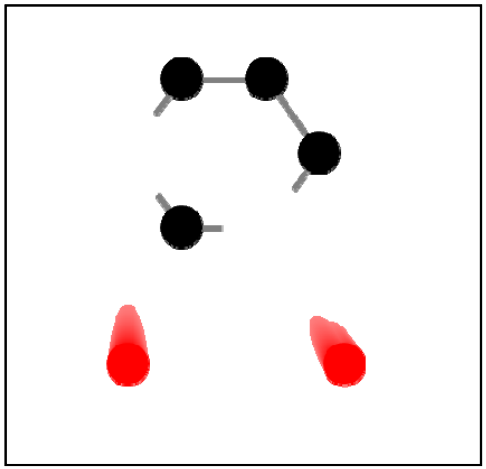

Status Report: Experimental investigation of beryllium. 9 October 2014

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Experiments:

Investigation of the as-received Be

Investigation of the existing proton Be windows

- “real” GeV proton irradiation;
- irradiated volume is big enough for microstructural investigations and micromechanical tests

Simulation with ion irradiation experiments

- flexibility of irradiation conditions
- observations of the evolution of the microstructure;
- reasonable correspondence of He/dpa ratio.

Low energy in-situ irradiation:

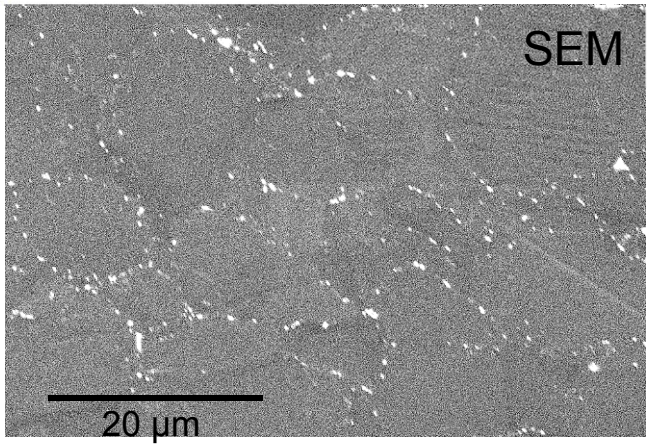
- easy variation of irradiation parameters;

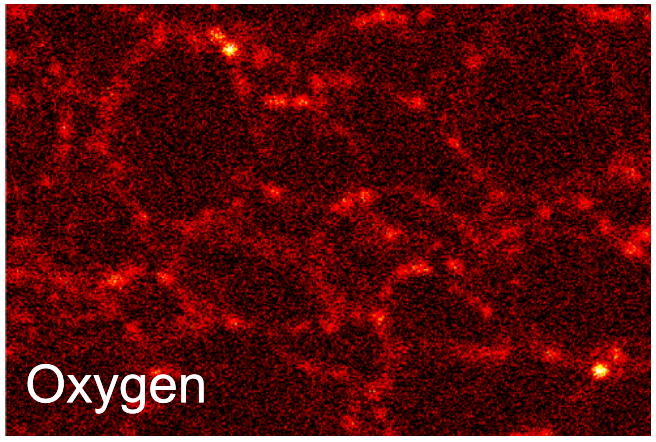
High-energy irradiation + PIE

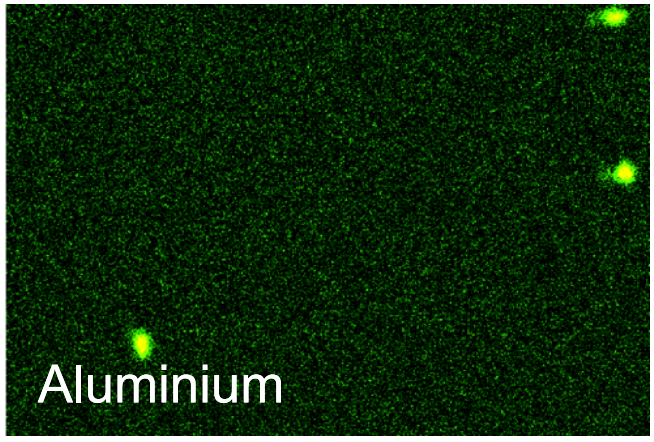
- microstructural and micromechanical tests data will be available

Characterisation of as-received Be

PF-60/VHP



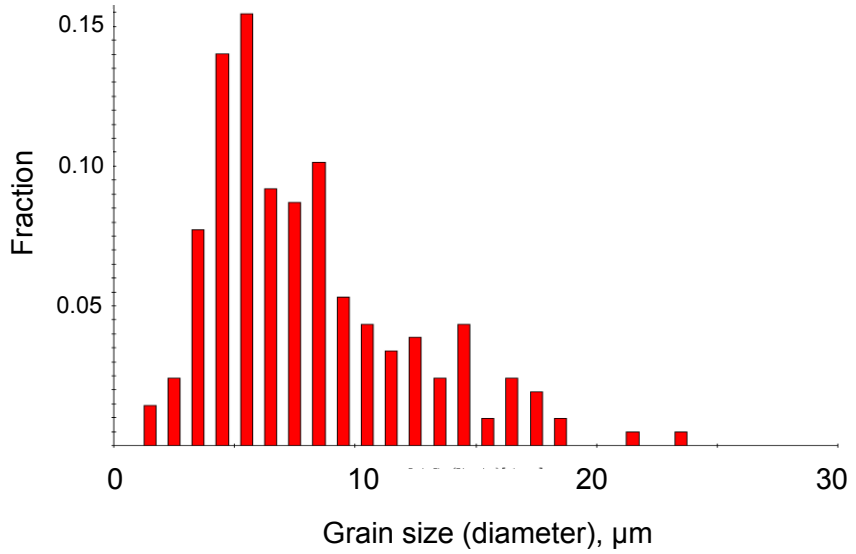




Grain size
Texture
Precipitates
Dislocation structure

SEM + EDX + EBSD

TEM (+ APT)



Samples preparation

- Mechanical polishing lab is organised.
- Polishing procedure up to “EBSD quality” is developed.
- PF60 – 4 samples are polished.
- S200F – 4 samples are polished.

EDX and EBSD

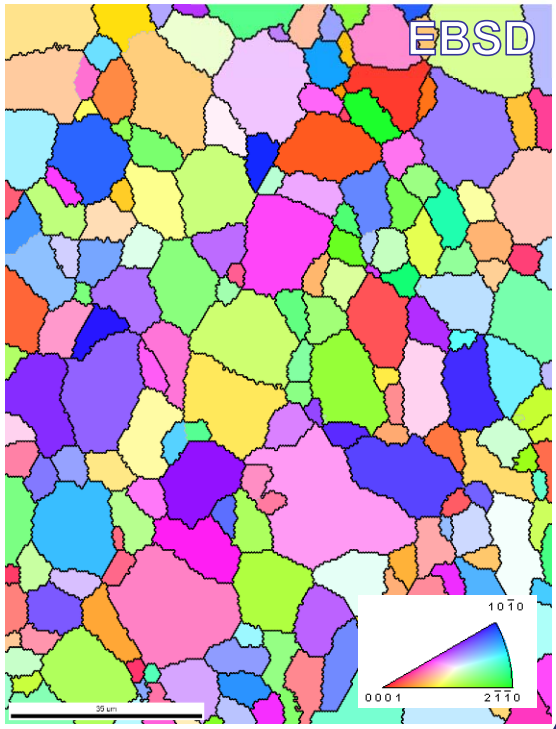
- PF60 – experiment are made. Quantification of the obtained results should be finished.
- S200F – will be characterised after the surface contamination test result.

TEM and APT – FIB at CCFE should be used.

- FIB trainings are finished. “Driving test” is next week.
- Be sample will be transferred to CCFE next week for the contamination test.
- Plan to start FIB of Be in late October – beginning of November

Nanoindentation

will be made after the nano-indenter repairing



35 µm

300 kW NuMI beam window
(MARS calculations of Brian Hartsell, Fermilab)

- 120GeV proton beam
- about 3×10^{13} protons per pulse, 0.5 Hz
- 1.57×10^{21} protons during its lifetime
- 1.1mm beam sigmas, X and Y
- T ≈ 70ºC

300 kW NuMI beam window

The window can be accepted by the University. Will be shipped from Fermilab soon

1) to determine the exposed area by the dosimetry film.

2) SEM + EDX characterisation.

3) nano-indentation (nano-indenter doesn't work now).

This year

Then – transfer to CCFE for FIB samples preparation.

December-January?

Low energy ion irradiation:

- FIB samples preparation at CCFE should be started.
- Be sample will be transferred to CCFE next week for the contamination test.
- Next step: preparation of samples. This year.

High energy ion irradiation:

- mechanical polishing procedure is developed;
- irradiation conditions are determined (multi-energy implantation).
- aluminium coating of the test sample (non-toxic) is delayed due to the technique failure. No updates since mid of September.