



SP B.1 Characterize surface erosion induced by hypervelocity W dust impacts: dust-gun experiments and analyses.

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Objectives and strategy of the task

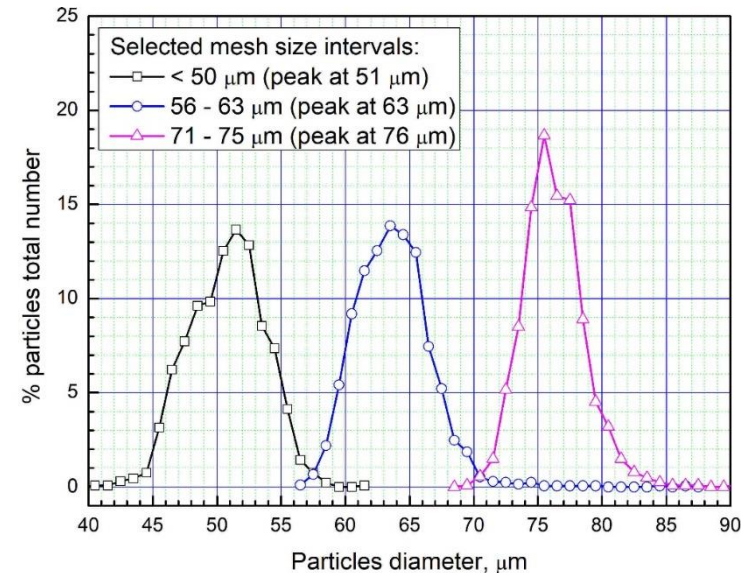


Objectives:

- ❖ Experimental investigation of the **surface erosion, due to hypervelocity W dust impacts on W substrate**, with the aid of a dust gun shooting system.
- ❖ Formulation of a **damage scaling laws** and extrapolations to ITER.

Strategy:

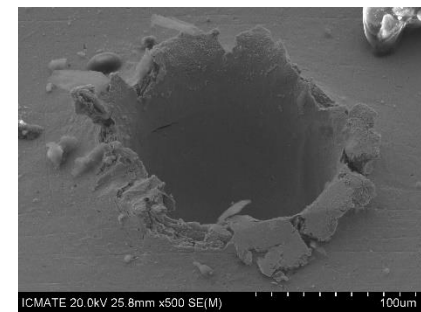
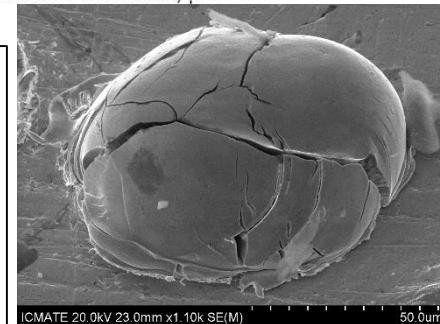
- Get monodisperse dust and **prepare samples**, by means of a dust gun shooting system, in the speed range of 0.6-3 km/s (**2021**).
- **Analyse the craters** obtained by means of SEM (craters diameter), by optical microscope (craters depth), and by mechanical profiler (craters diameter and depth). **2021-2022**.
- **Extrapolation of a damage law** and estimation of expected erosion material amount from targets (**2022**).



Top: Spherical W dust size distribution after meshing.

Middle: SEM image of a grain sticking on crater (600m/s).

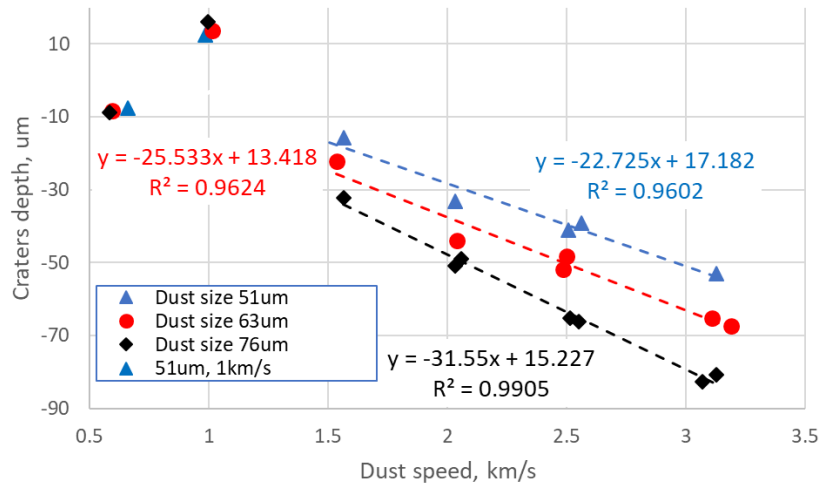
Bottom: SEM image of a crater due to dust impact at speed of 2km/s.



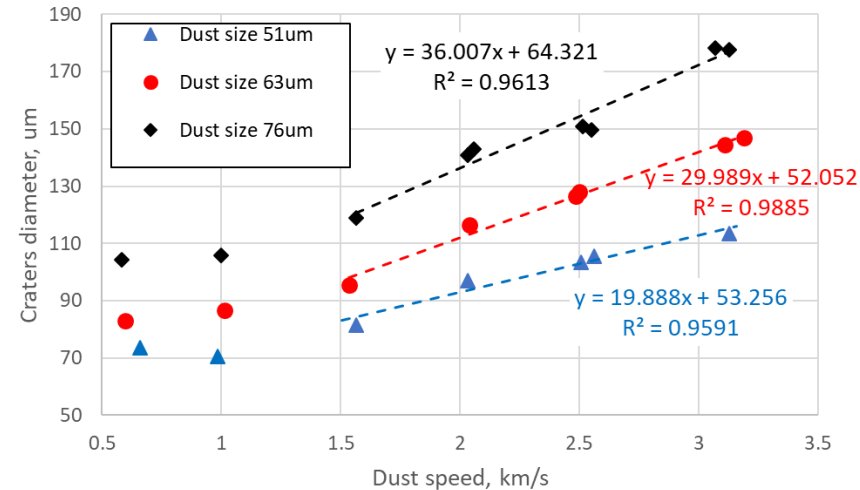
Status of the task



Craters depth vs dust speed:

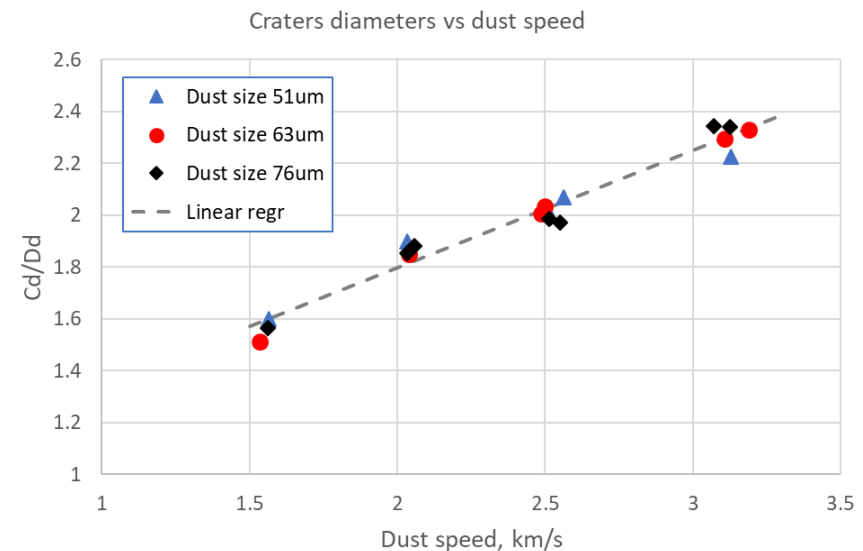
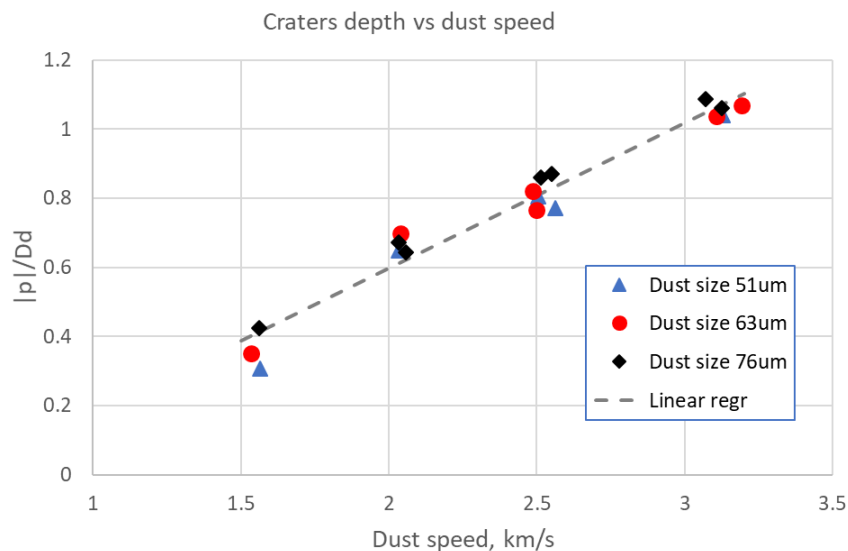


Craters diameters vs dust speed:



W dust size: 51, 63, 76 μm ;

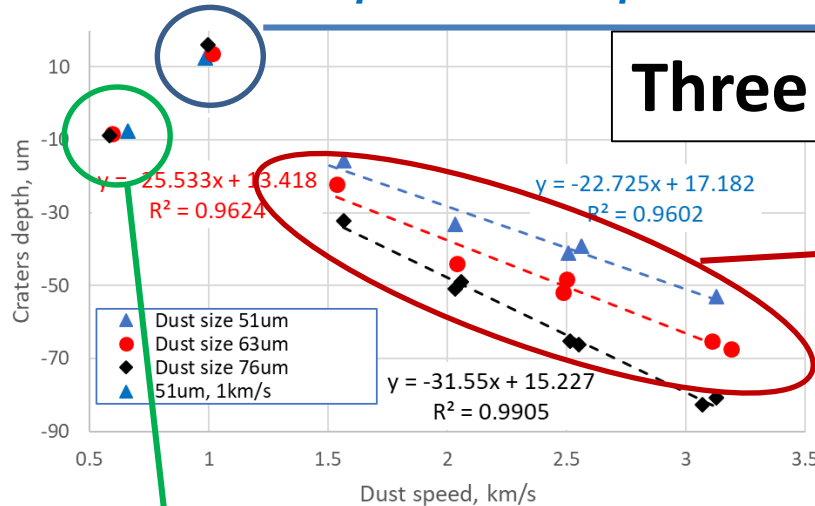
Impact speeds: 0.6 – 3 km/s



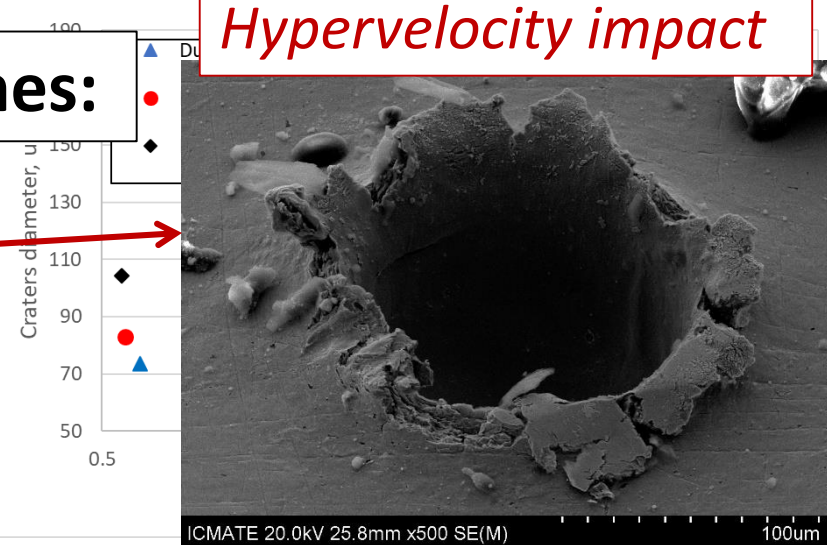
Status of the task



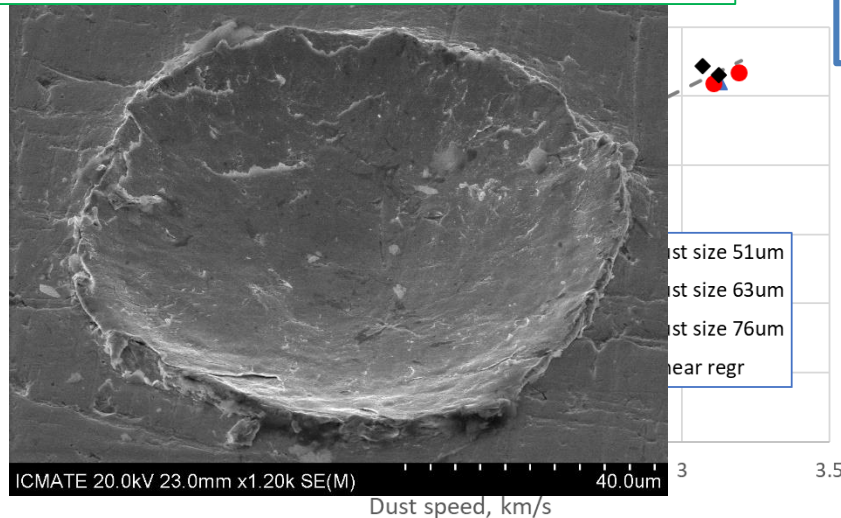
Craters depth vs dust speed:



Craters diameter vs dust speed:

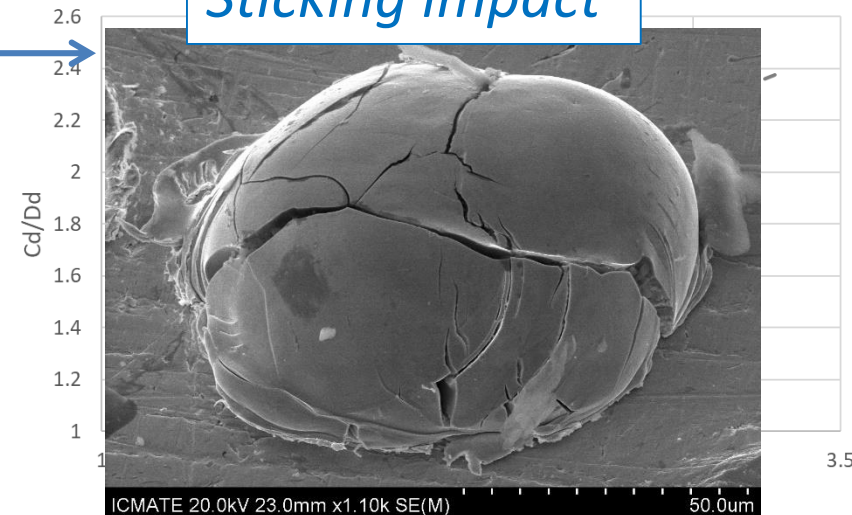


Plastic deformation impact



Impact speeds: 0.6 – 3 km/s

Sticking impact



What to do in 2022



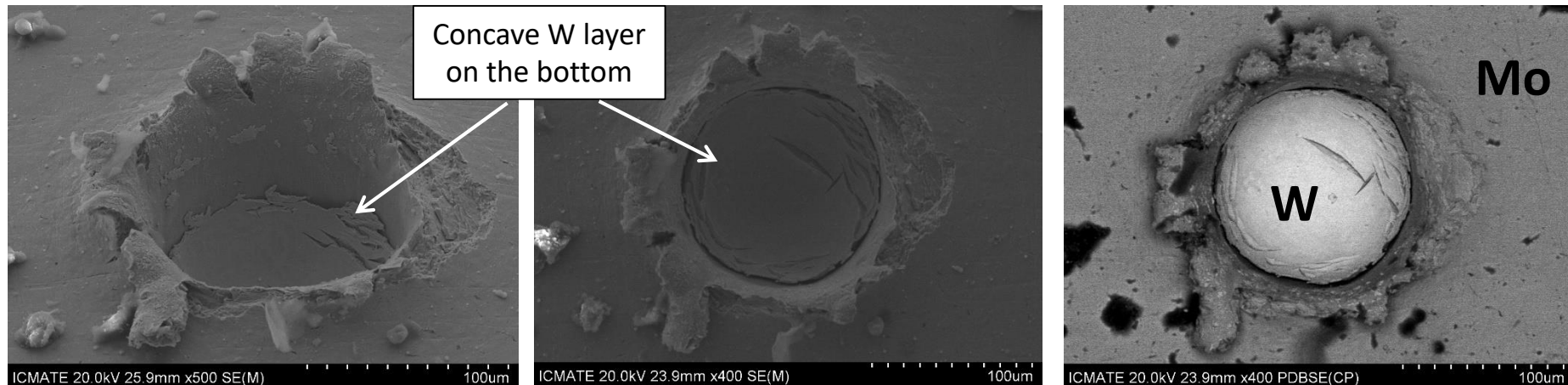
- ❖ Shoot & analyse **samples with mixed materials** (Mo on W and vice versa) to try to distinguish and study molten impact phenomena.

Partially done in first months of 2022 – results are under analyses!

- ❖ Extrapolation of a damage law and estimate the material erosion amount of target on the basis of existing theories for different regimes/materials.
- ❖ Present results at the SOFT 2022 conference (September 2022).

The task is on time.

SEM images of a crater of W dust impinging on Mo substrate at 2087 m/s.
Left: SEM image tilted of 45°; **middle:** SEM image at 90°; **right:** Backscattered images.





Thank you for your attention