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TECHNISCHE HOCHSCHULE DEGGENDORF

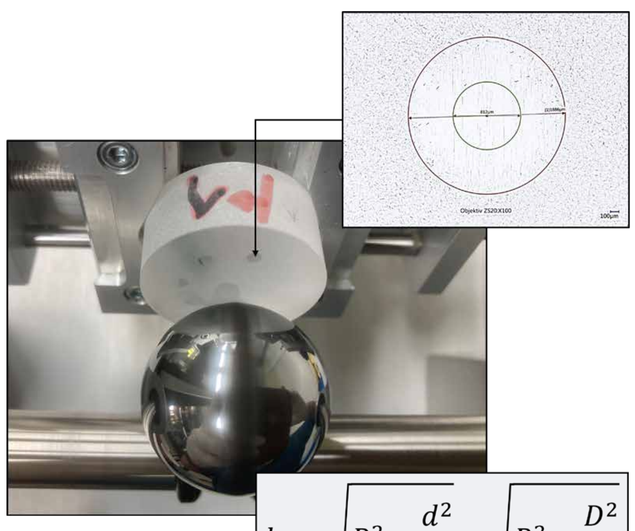
INFLUENCE OF ATMOSPHERIC HUMIDITY DURING THE STORAGE OF OPTICAL COMPONENTS ON THE BEHAVIOUR OF SUB SURFACE DAMAGES

What are sub surface damages (SSDs)?

- Micro damages under the glass surface.
- Created during processing (mainly grinding)
- Negative influence on optical behaviour
- Local scattering centers
- Risk of cracking

Storage Influences:

Does ambient water cause any changes to the SSDs during storage (at least under temperature influence)? Does undercritical crack growth increase SSDs?

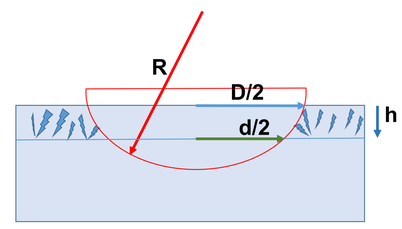


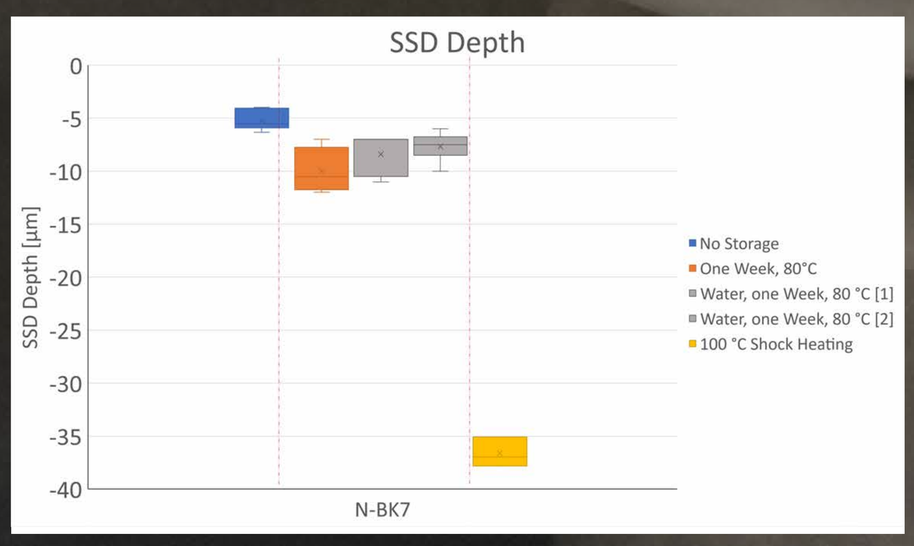
$$h = \sqrt{R^2 - \frac{d^2}{4}} - \sqrt{R^2 - \frac{D^2}{4}}$$

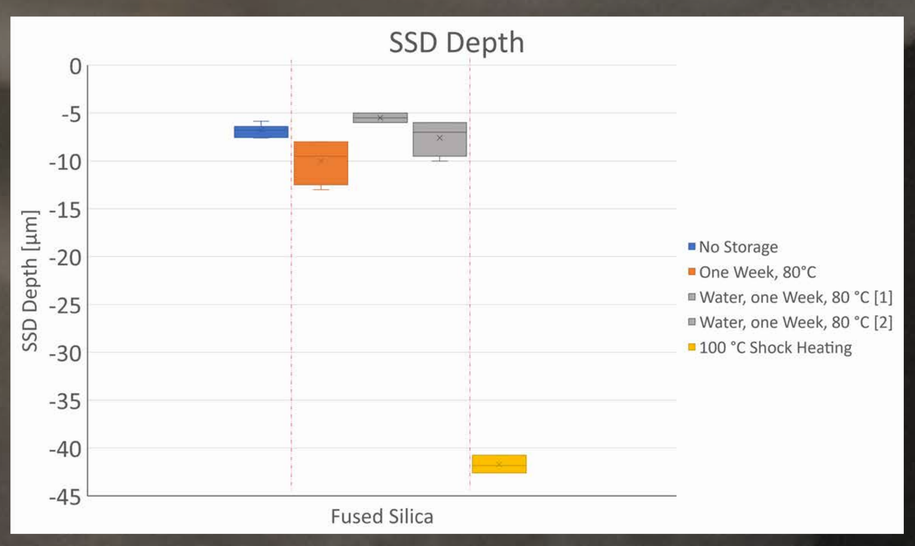
Evaluation Procedure:

1. (Fine) grinding of the surface
2. Production of calottes (kaloMAX II)
3. Etching the calottes (hydogenic fluoride acide)
4. Measuring the defect free and defective areas (ligh microscopy)
5. Calculate SSD Depth (Formula)

R: Radius of the ball
D: Diameter of the calotte
d: Diameter of the SSD free area
h: Maximal SSD Depth







	N-BK7		Fused Silica	
Storage	Mean SSD Depth [µm]	Standard Deviation [µm]	Mean SSD Depth [µm]	Standard Deviation [µm]
Dry Sample	-10	1,74	-10	2,12
Wet Sample 1	-8,4	1,38	-5	6,7
Wet Sample 2	-7,5	2,12	-7,6	1,62

	N-BK7		Fused Silica	
Storage	Mean SSD Depth [µm]	Standard Deviation [µm]	Mean SSD Depth [µm]	Standard Deviation [µm]
No storage	-5	0,86	-7	0,58
100°C	-37	1,14	-42	0,76

- The dry storage leads by trend to slightly deeper Sub Surface Damages, especially for fused silica.
- The shock heating leads to very deep (partially not measurable) Sub Surface Damages
- Storage conditions influence Sub Surface Damges and should be considered for further processing

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