Wear behaviour of the die while coining silver blanks

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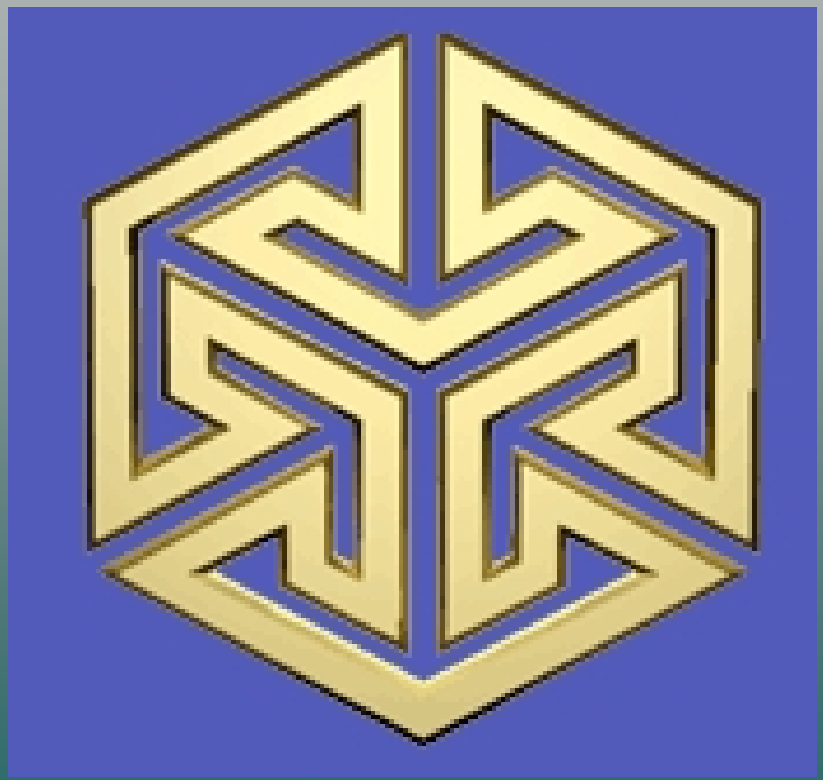
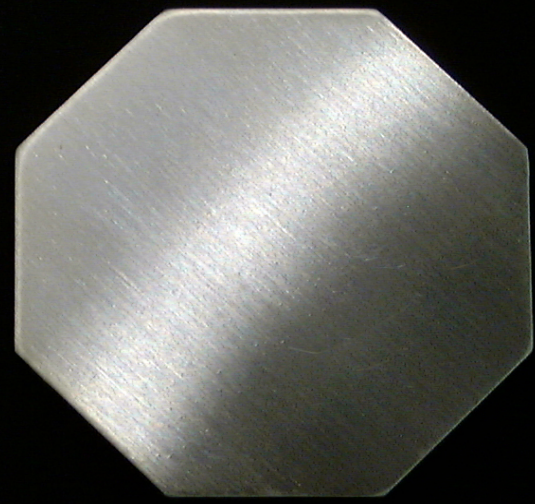


- **fine metals: Ag, Au**
- **alloys**

- **blanks**
- **coins / medals**

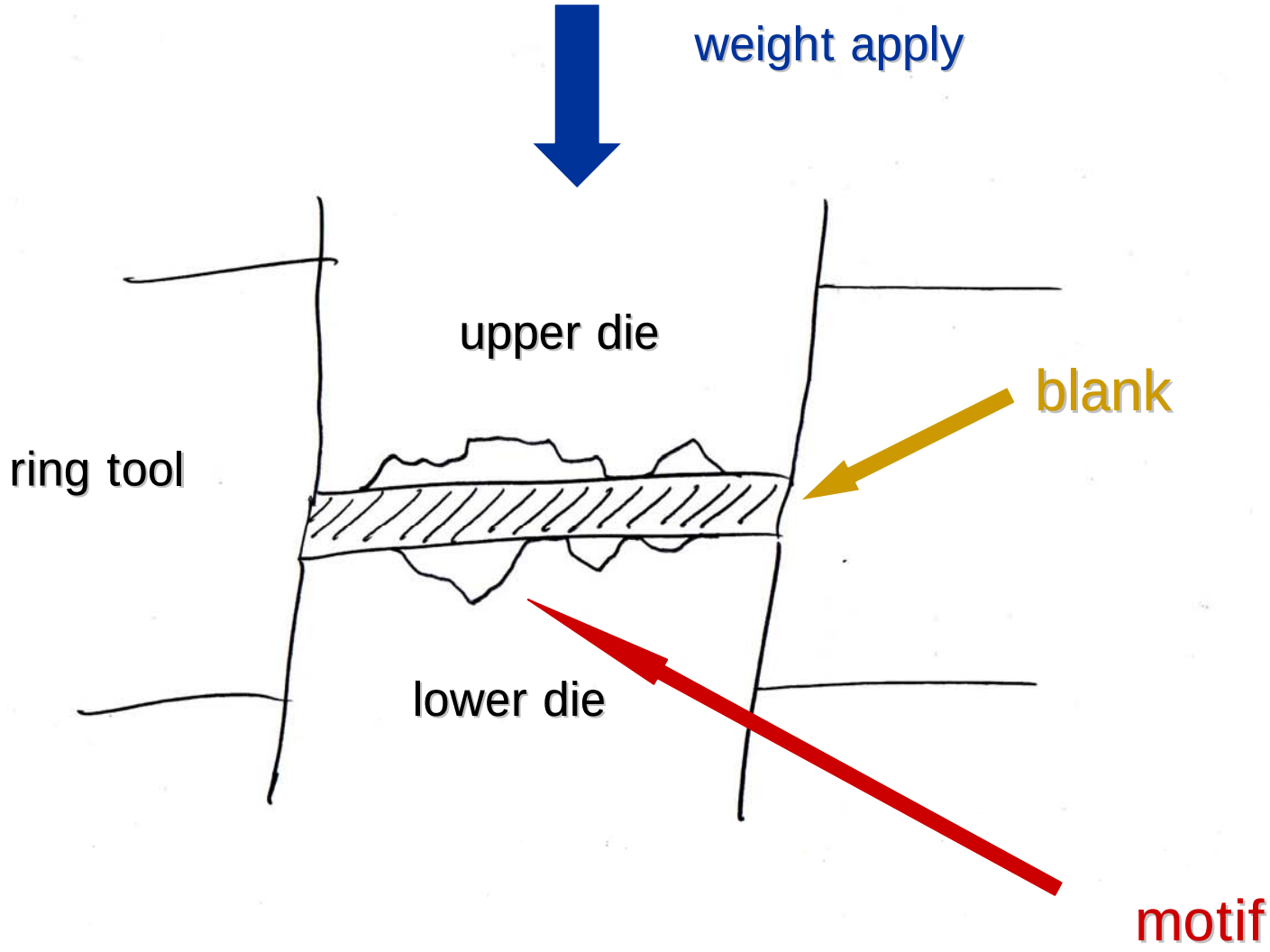
- **recycling**



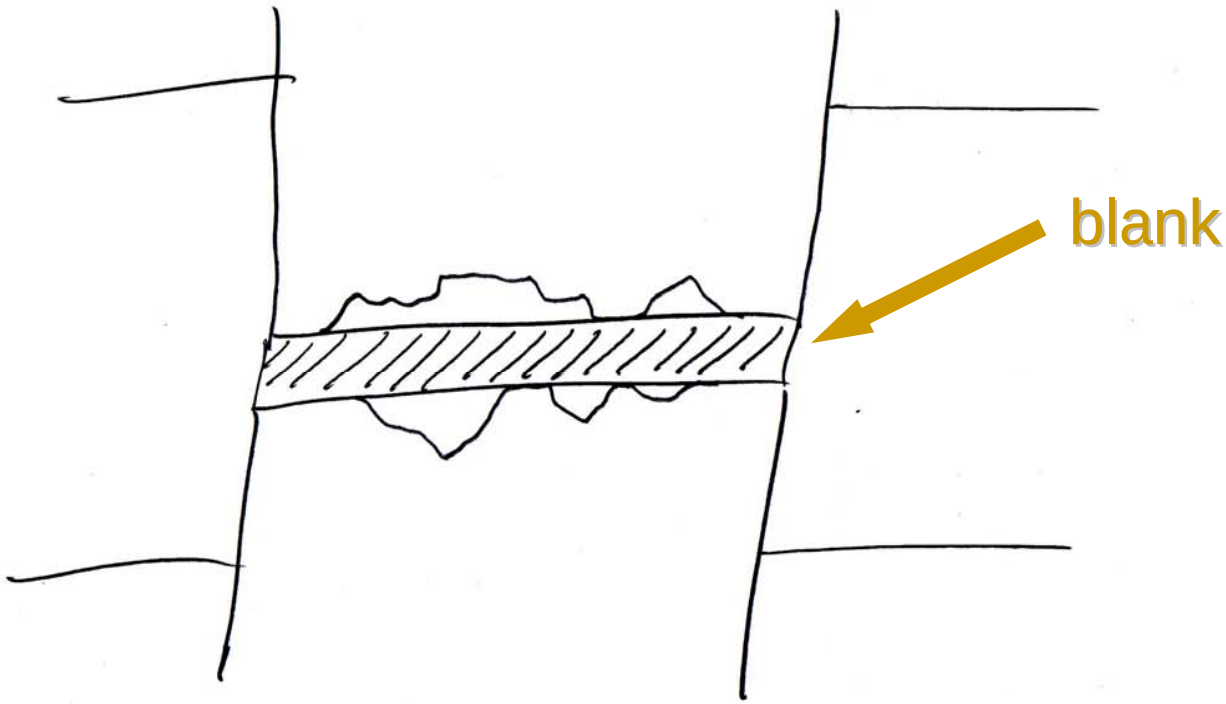
wear behaviour of the die

macroscopically

microscopically



wear:= property of the „system“

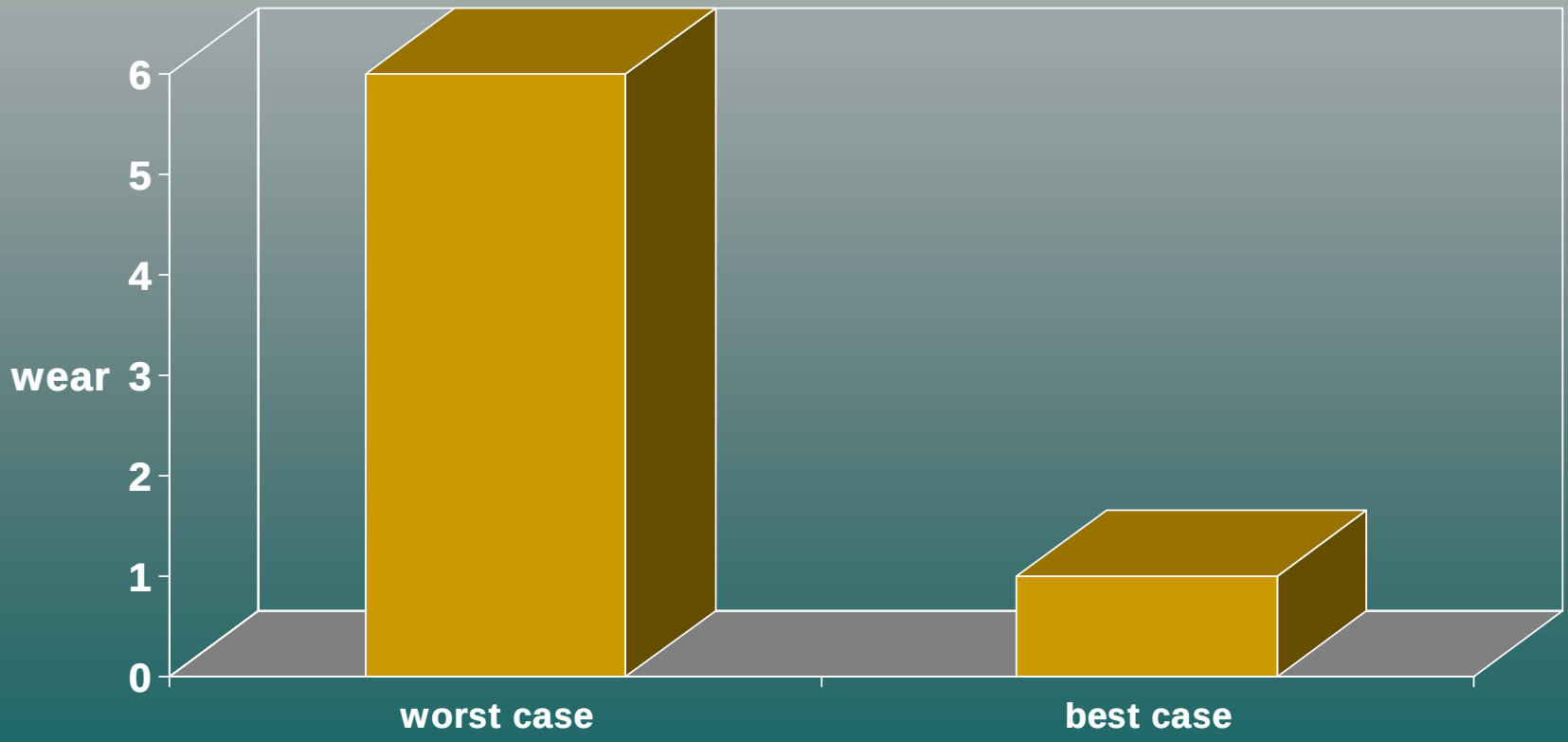


part I: the blank

test procedure

- upper and lower die
- mechanical press
- weight 180 to
- 50x coining (one stroke)

assessment of microscopical
wear attack
by visual inspection
and comparison


wear
6
5
4
3
2
1
0
worst case
best case

Ag999 blanks: attributes and its levels

roughness

„bulk“ hardness

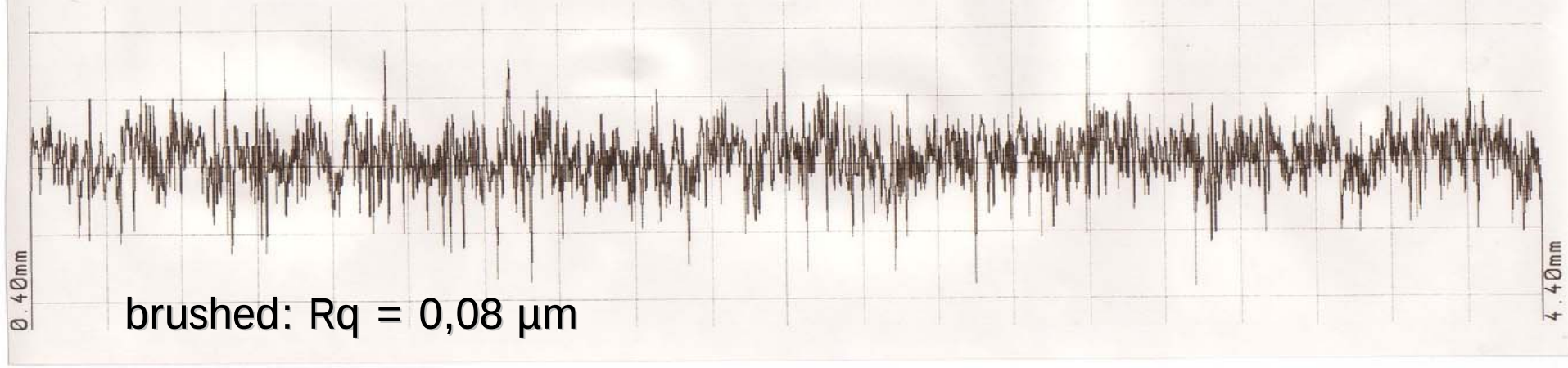
„surface“ hardness

roughness
--> surface treatment

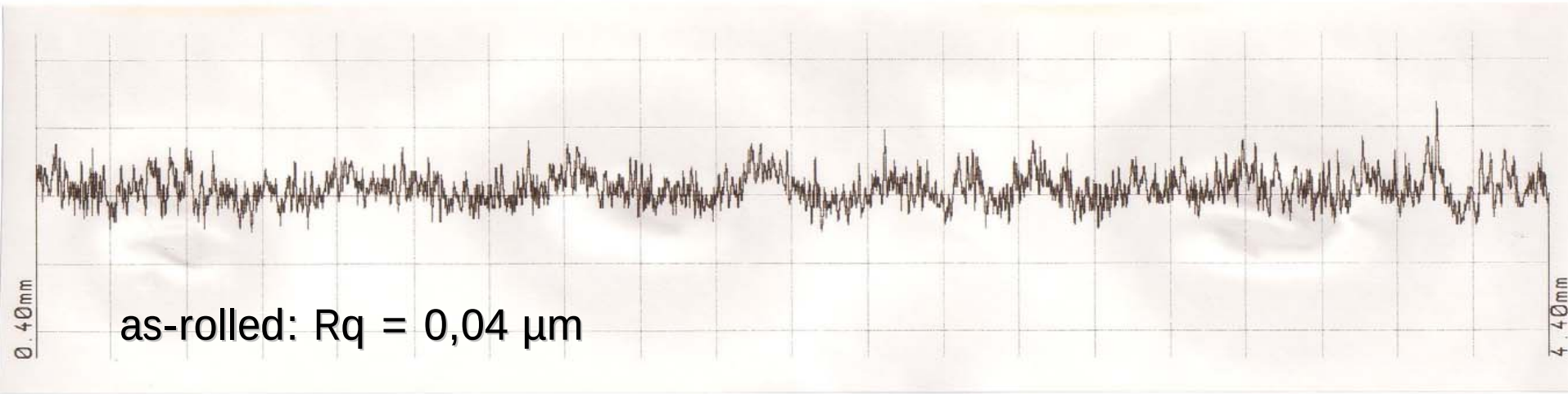
as-rolled

brushed

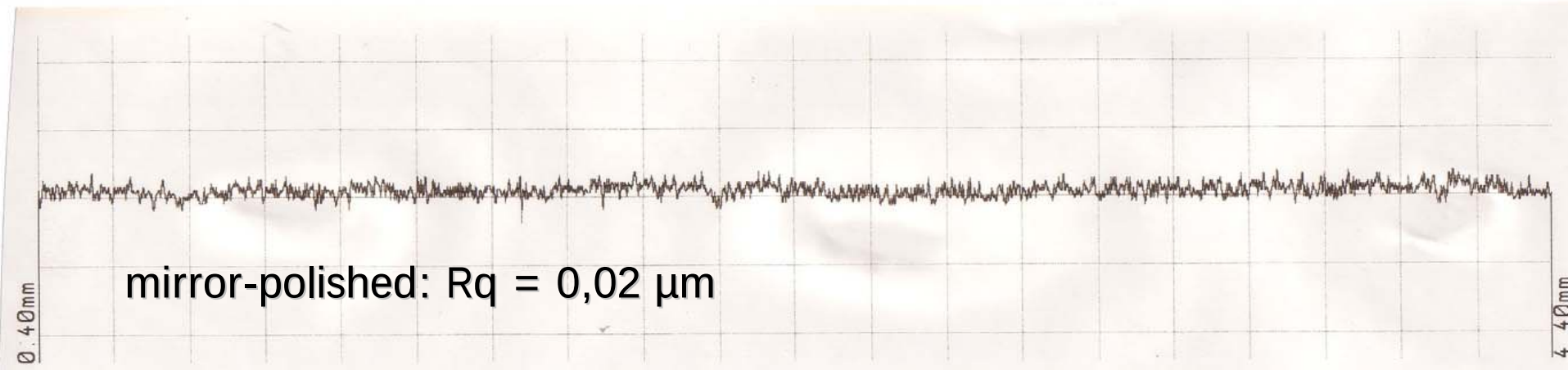
mirror-polished



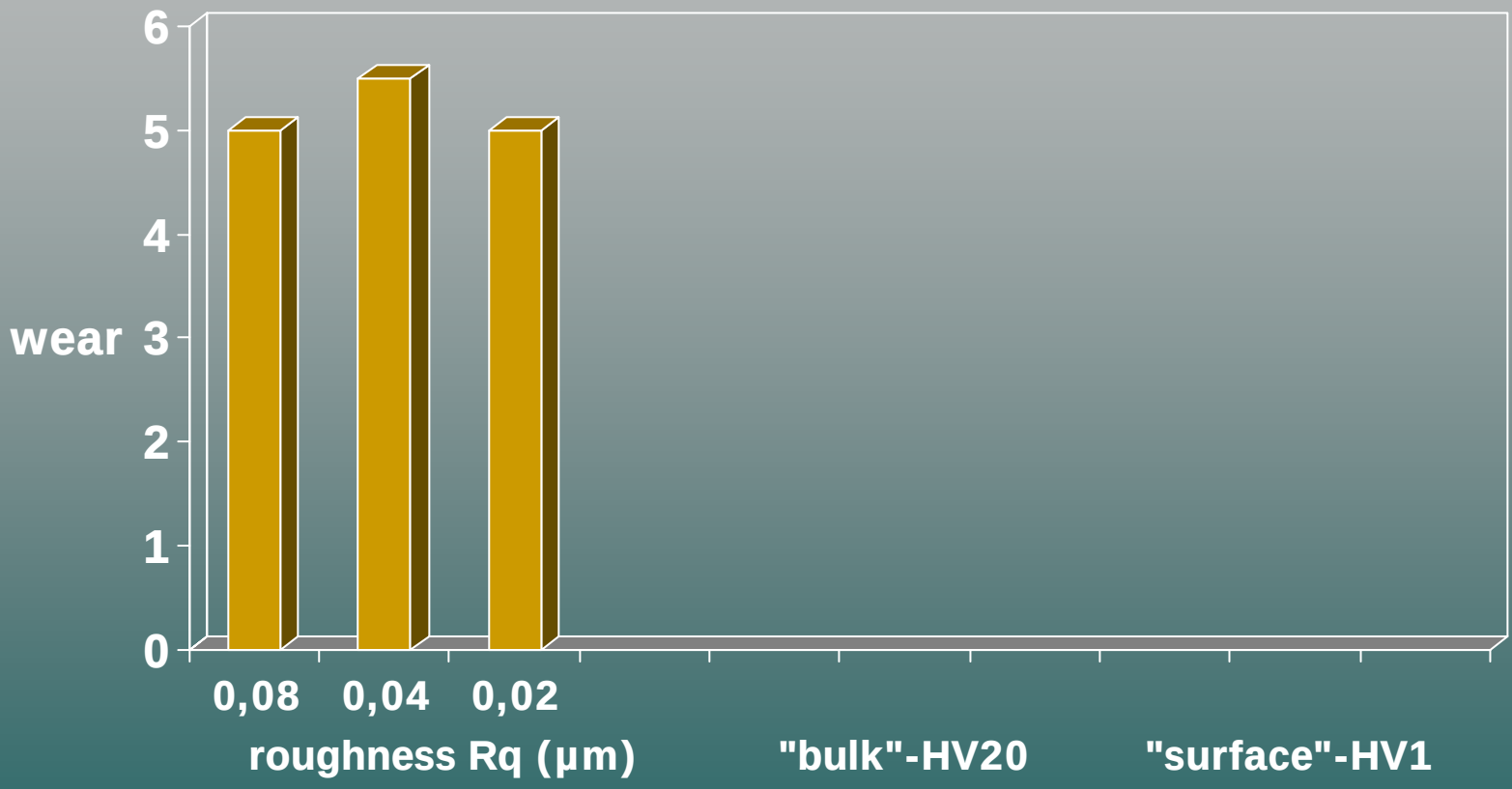
brushed: Rq = 0,08 µm



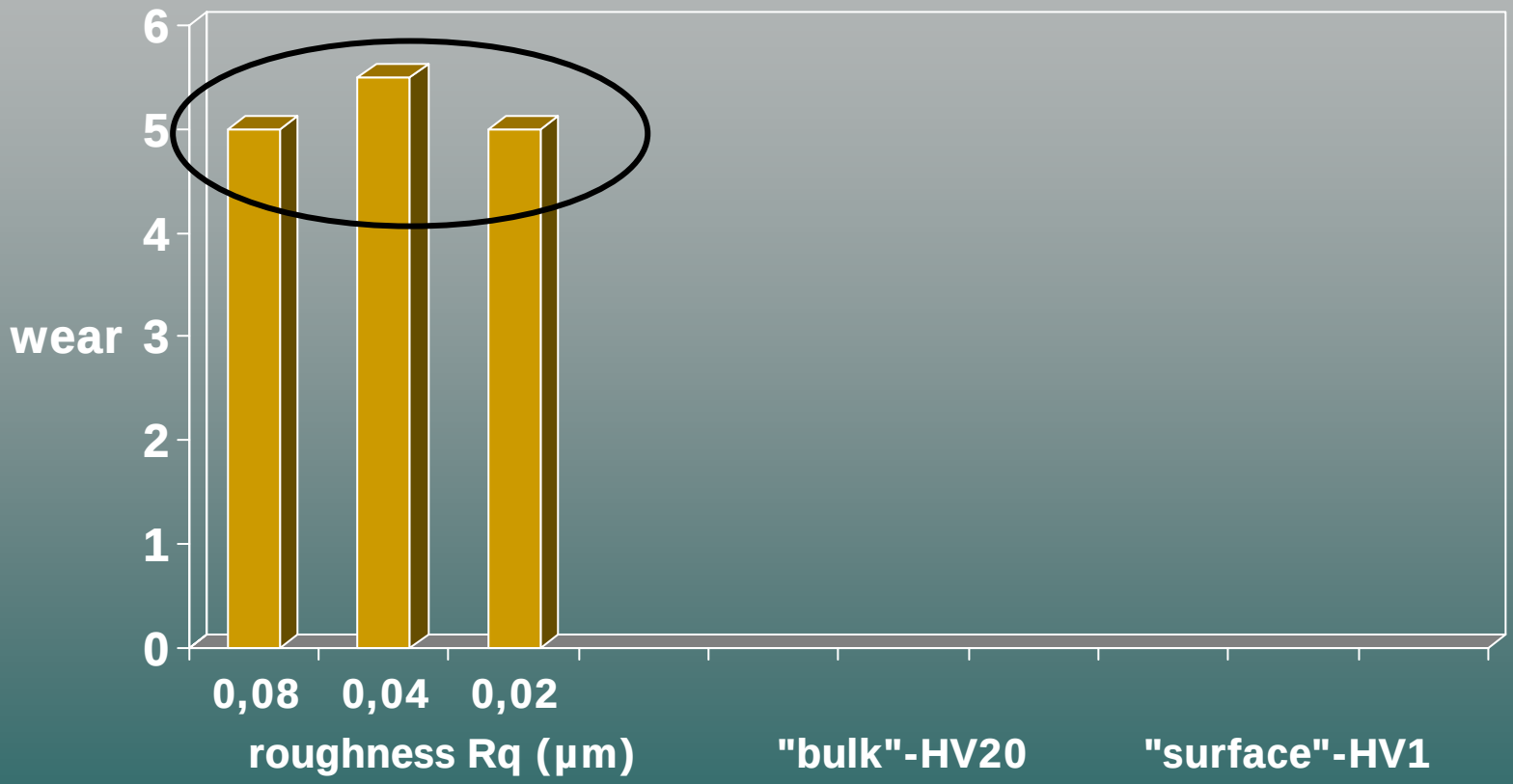
as-rolled: Rq = 0,04 µm



mirror-polished: Rq = 0,02 µm


wear
6
5
4
3
2
1
0
0,08
0,04
0,02
roughness Rq (µm)
"bulk"-HV20
"surface"-HV1

no significant attribute !

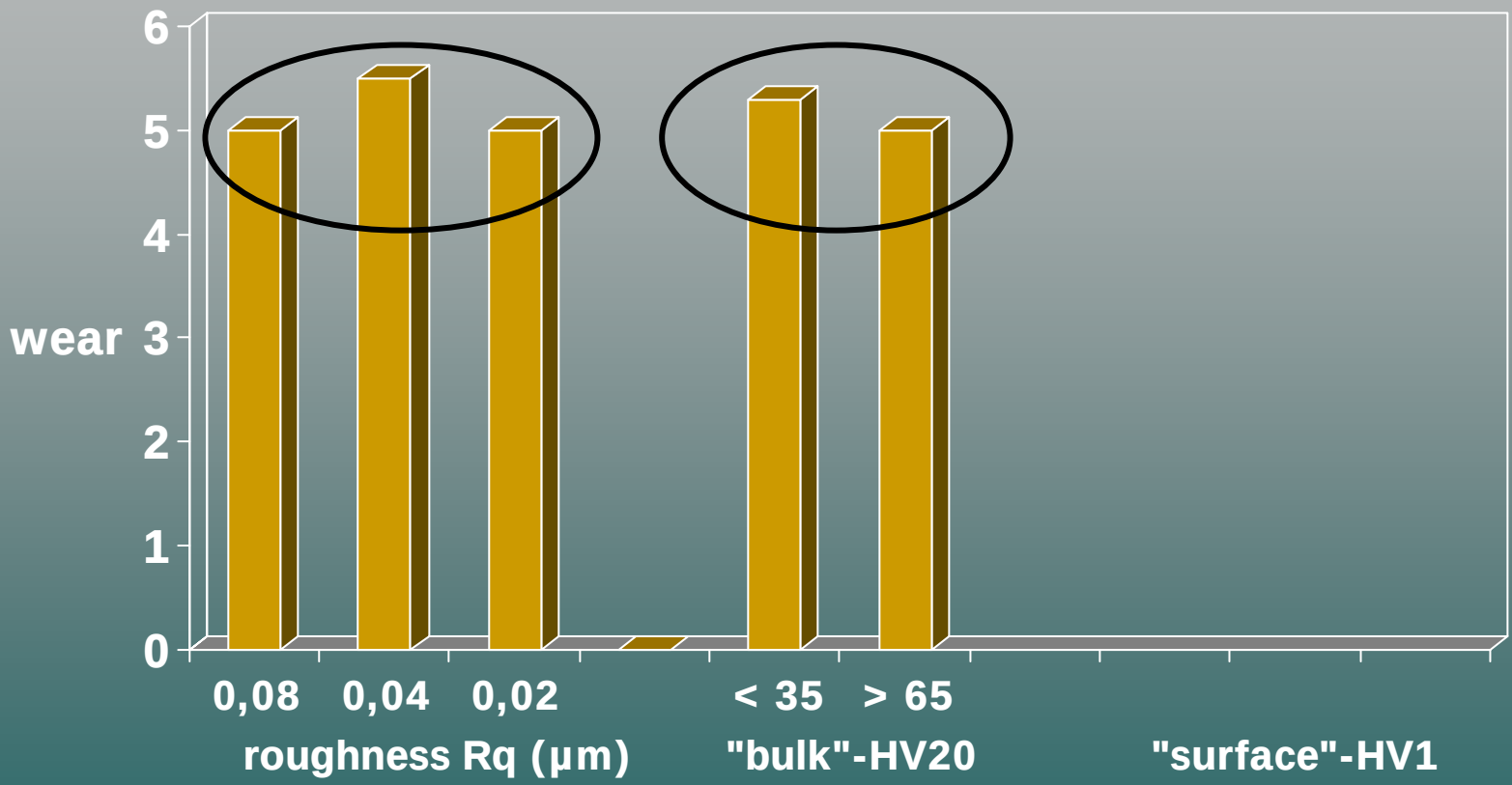


bulk hardness

--> rolling <-> annealing

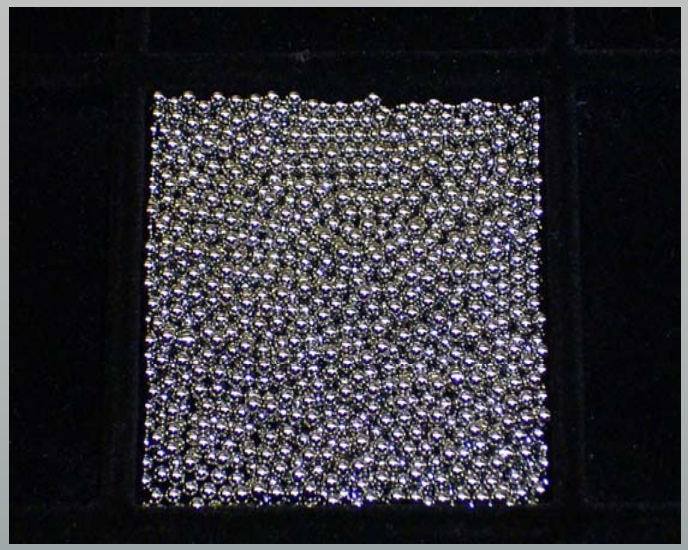
- < 35 HV20
- > 65 HV20

no significant attribute(s) !

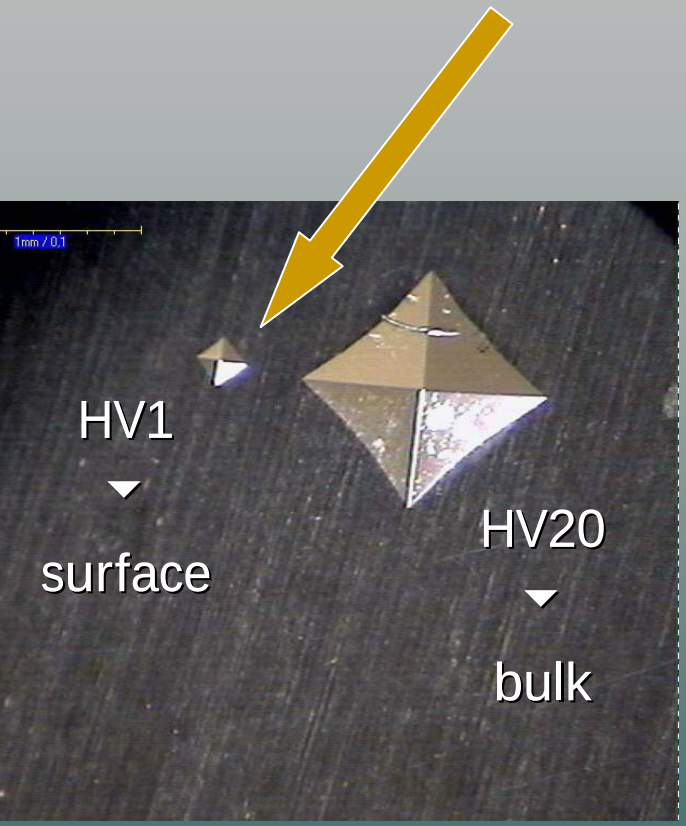


surface hardness

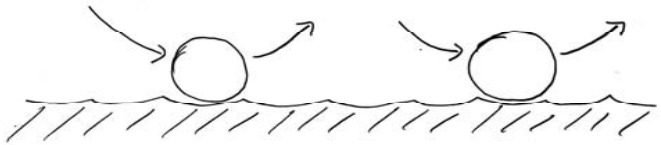
--> centrifugal polishing



surface hardness

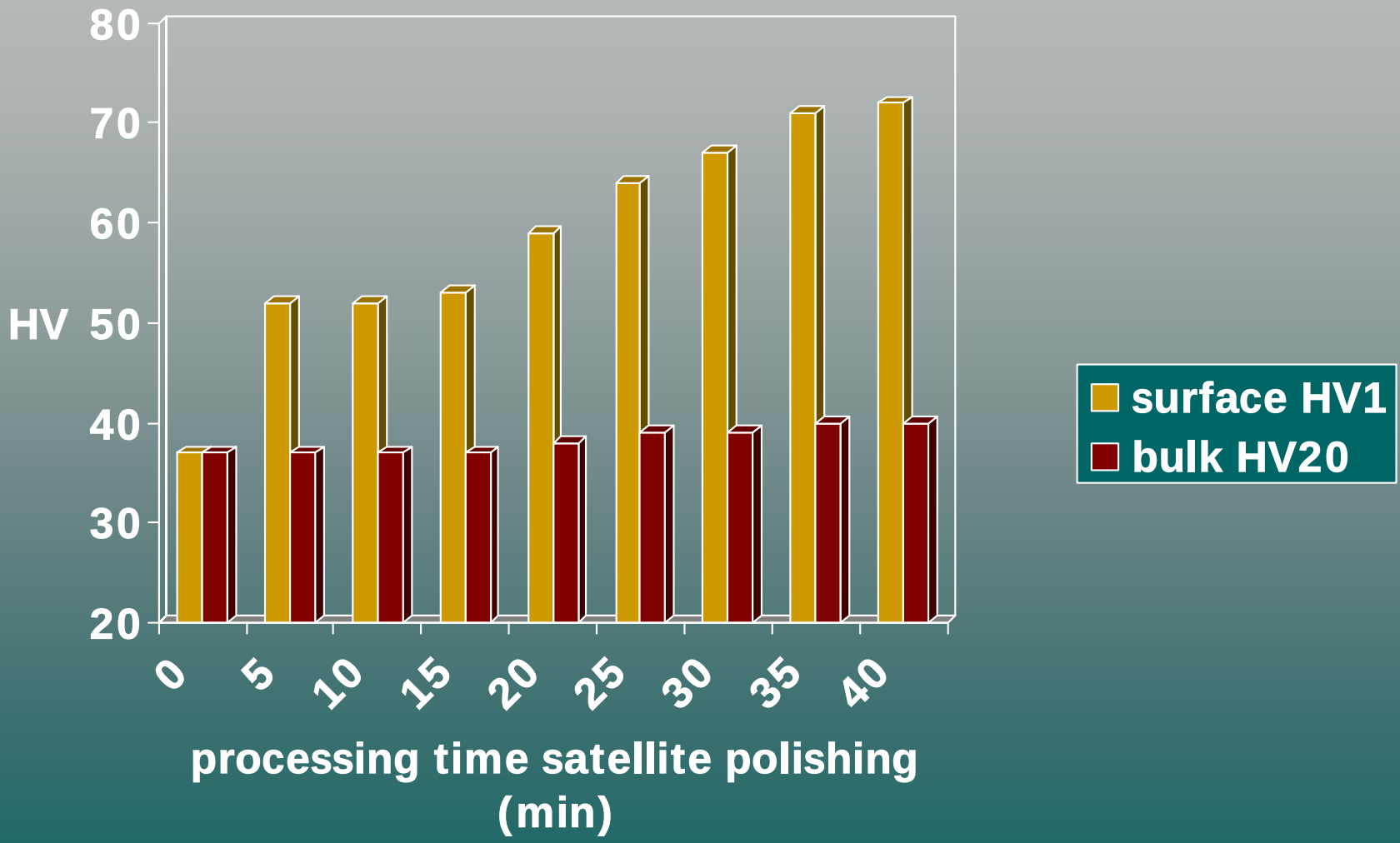


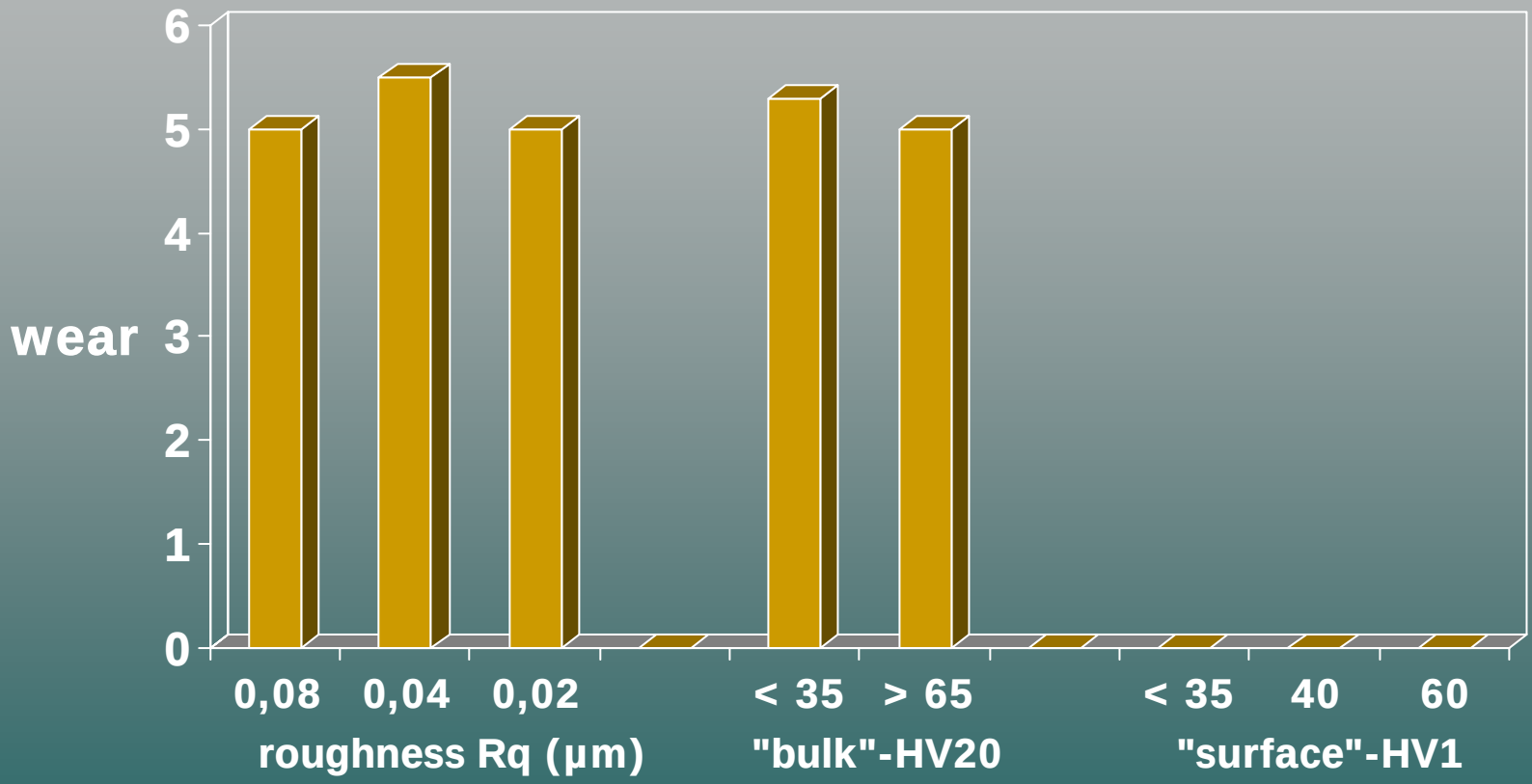
kinetic energy of the balls/satellites

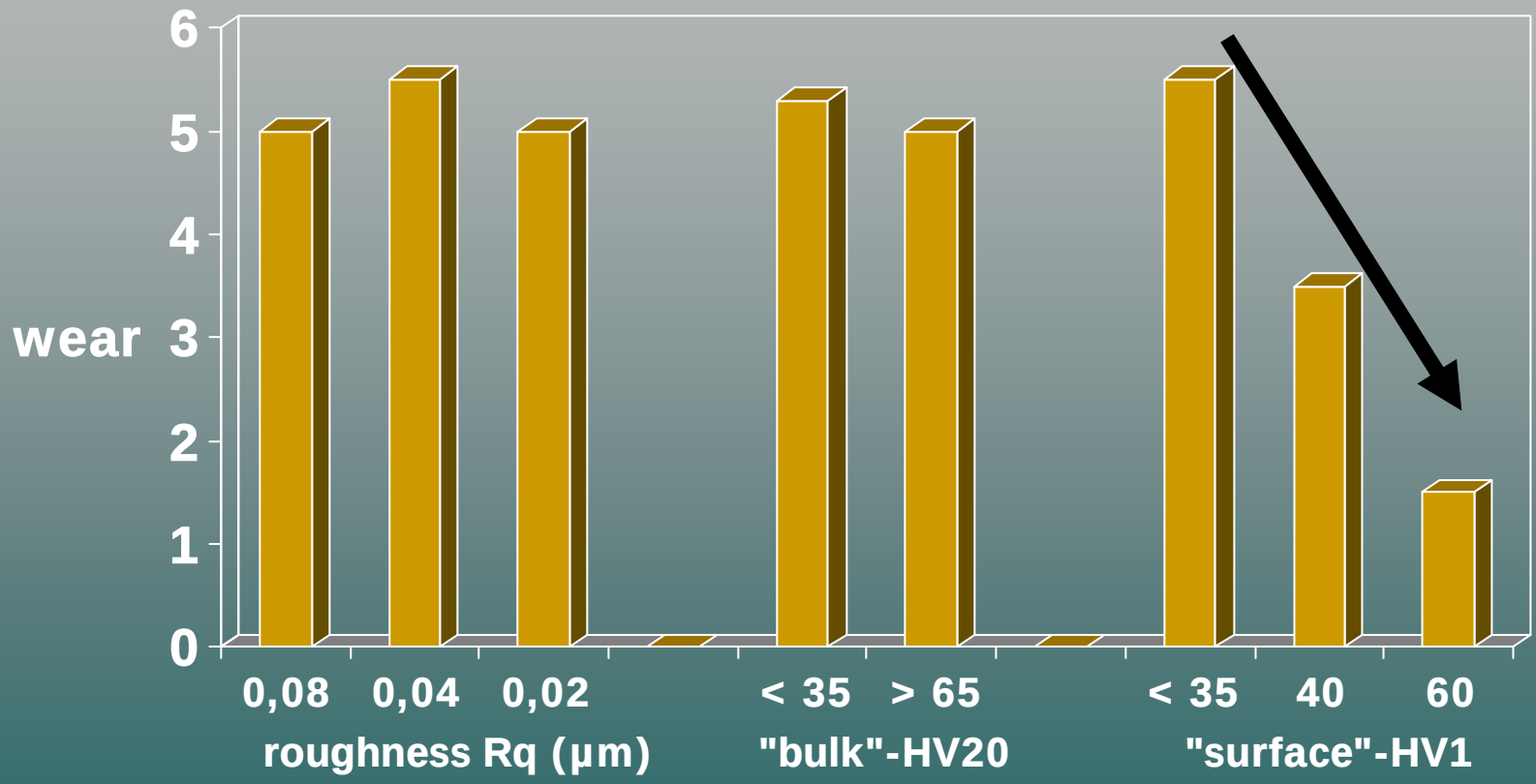


„compression stress“
in near surface layer

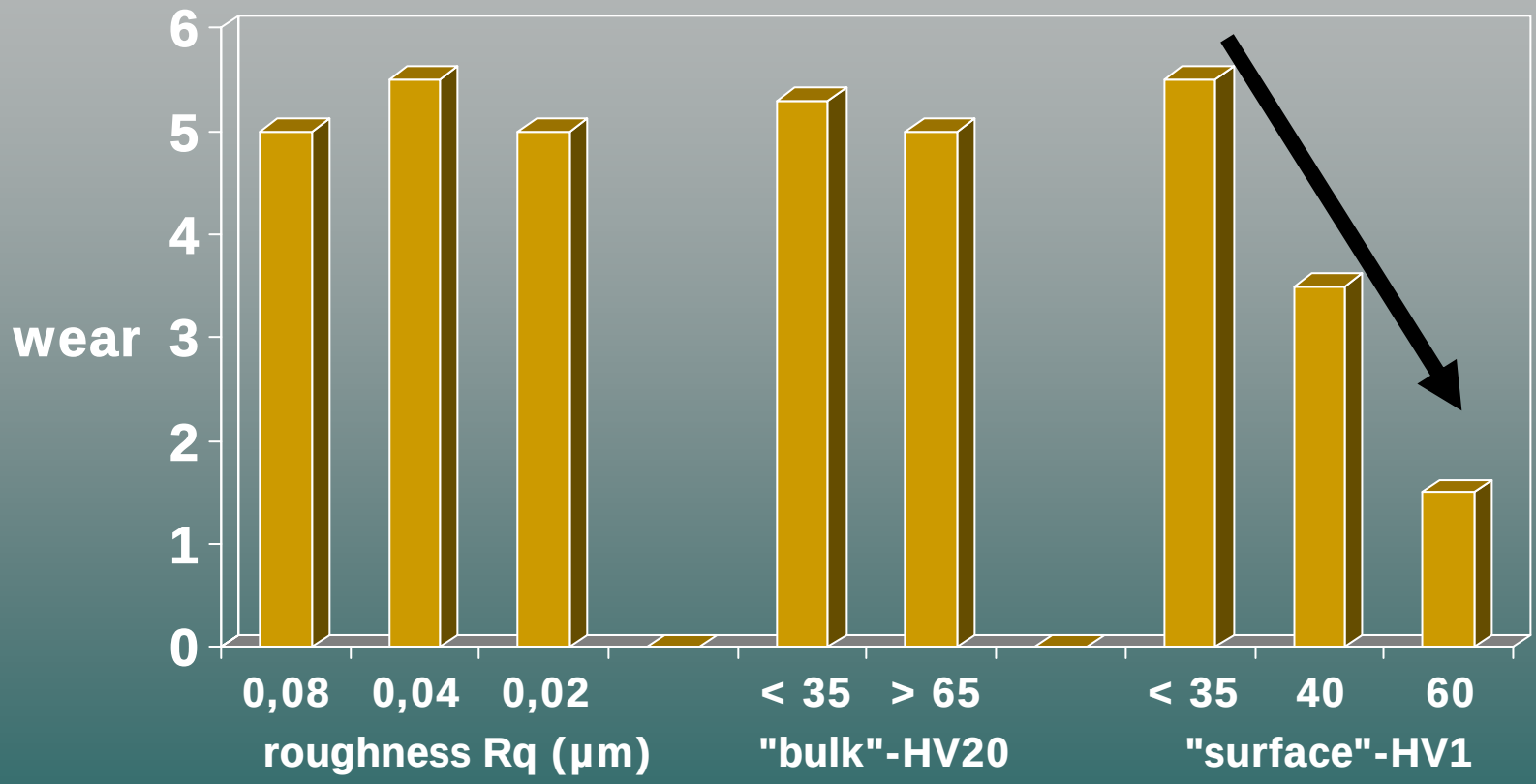
hardness: surface and bulk




wear
6
5
4
3
2
1
0
0,08
0,04
0,02
roughness Rq (µm)
< 35
> 65
"bulk"-HV20
< 35
40
60
"surface"-HV1


wear
6
5
4
3
2
1
0
0,08
0,04
0,02
roughness Rq (µm)
< 35
> 65
"bulk"-HV20
< 35
40
60
"surface"-HV1

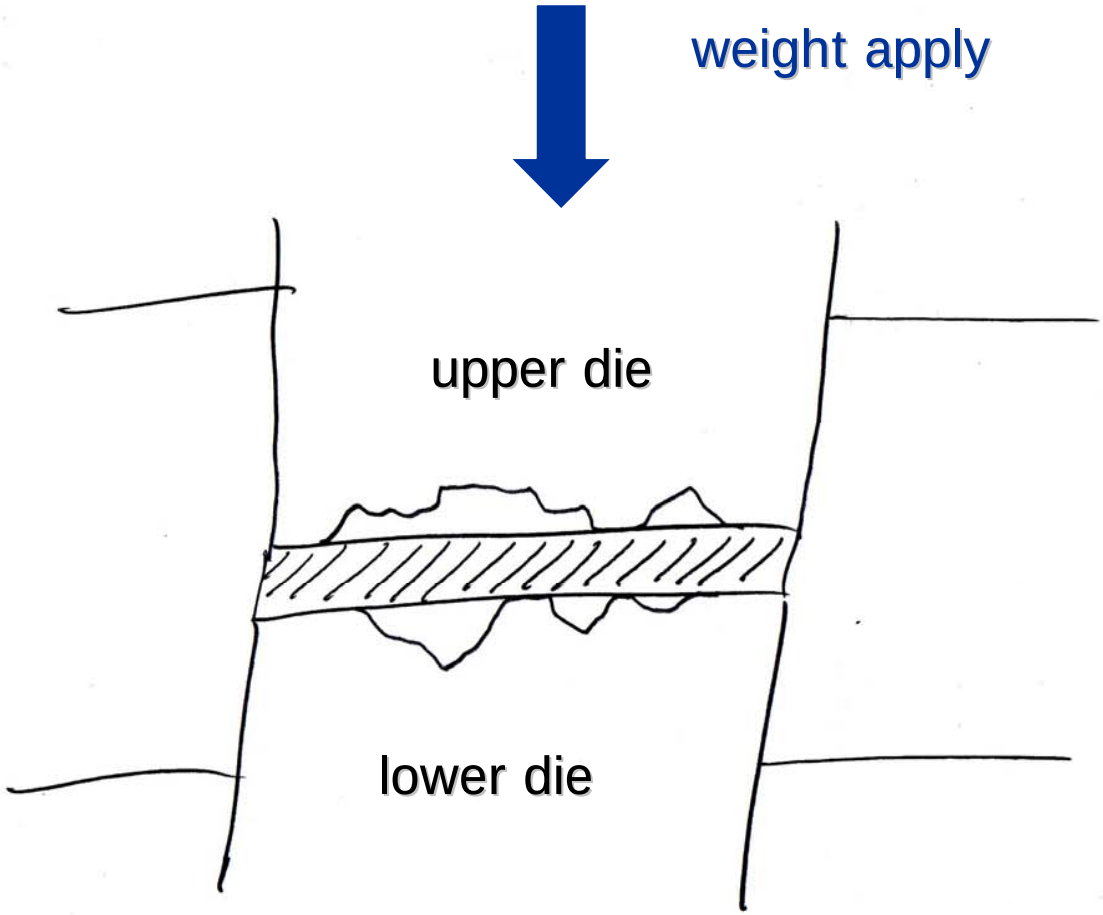
significant attribute !!!



conclusion:

if a soft or medium-hard blank Ag999 is needed in order to get a high deformation, choose a blank with a hard surface layer.

the centrifugal polishing with satellites hardens the surface of the blank very effectively and results in a minimal wear of the die.



part II: the die and the weight apply

see you

next WMF `07

in Berlin ...