Role of fracture toughness in impact-abrasion wear

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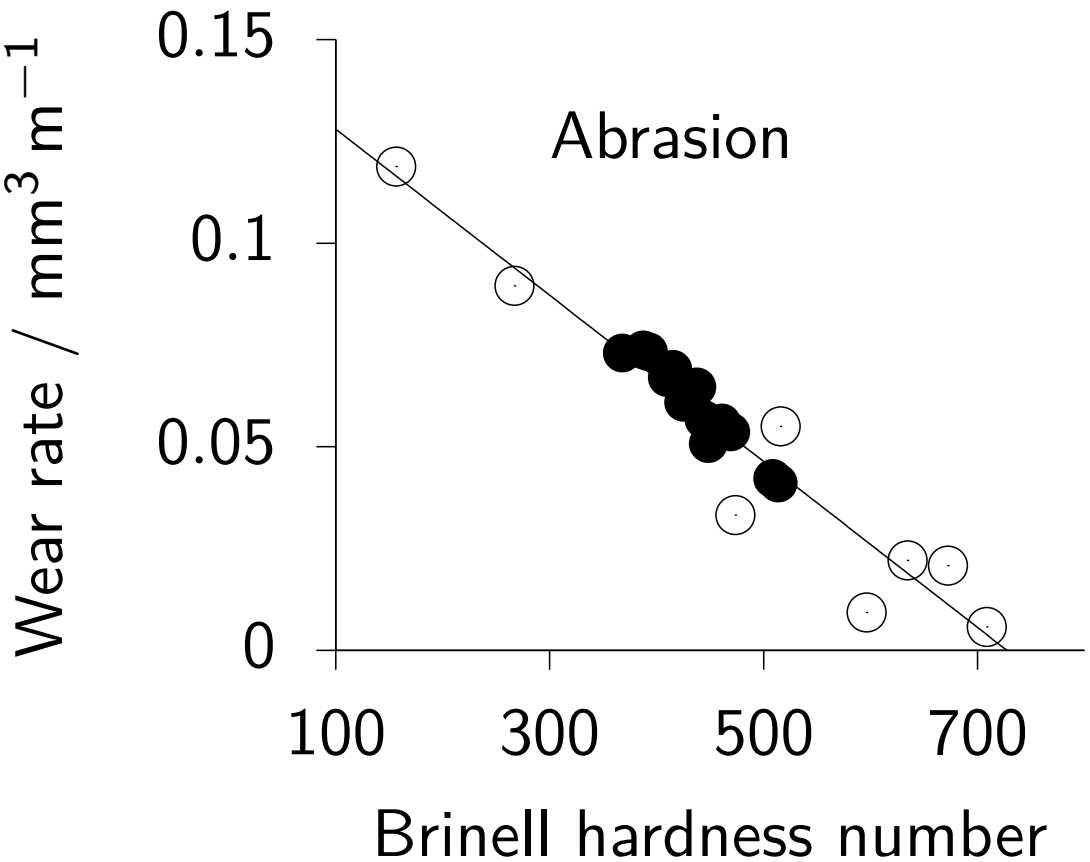
Wear in lifting and excavating industry

Loading

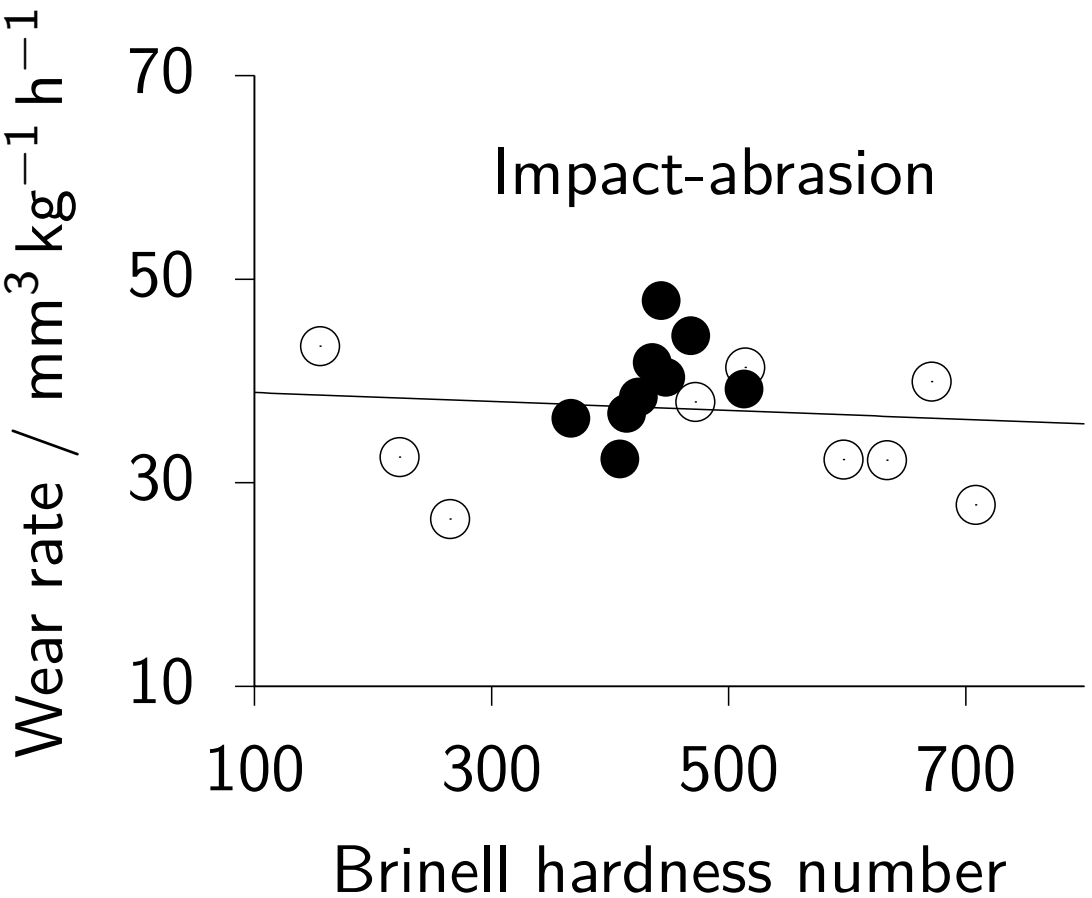
Unloading

Development of wear resistance steels



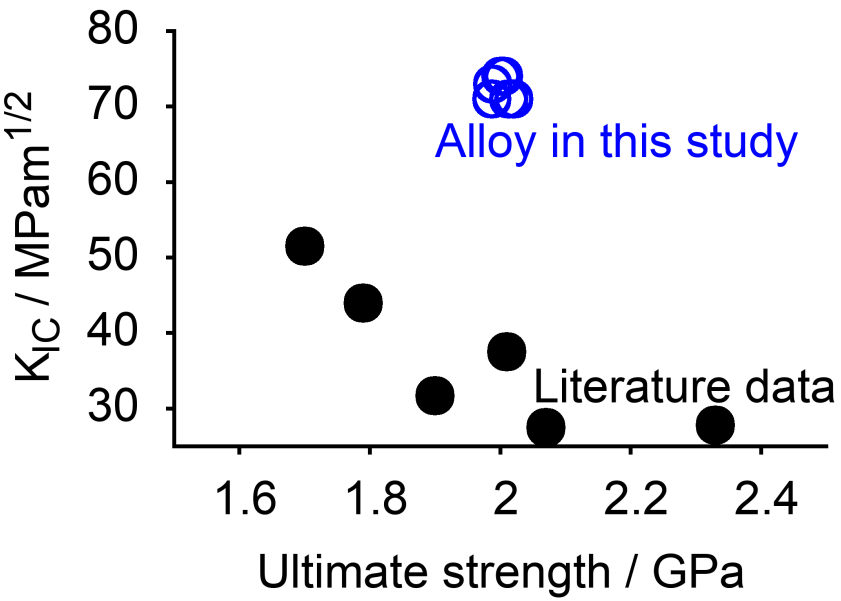
Joe H.Tylczak *et al.*, *Wear*, 1999

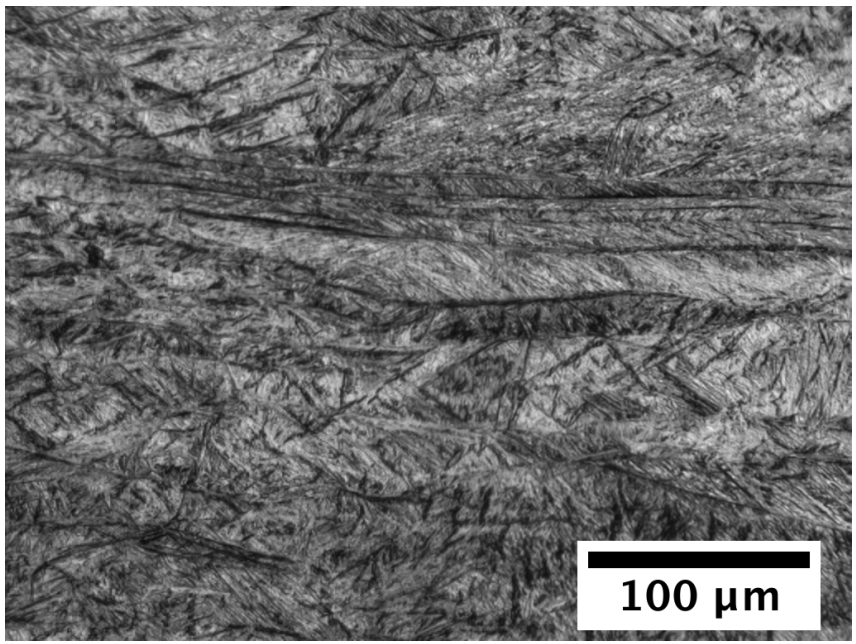
Steels under impact-abrasion wear



Joe H.Tylczak *et al.*, *Wear*, 1999

New steel: Hard AND tough

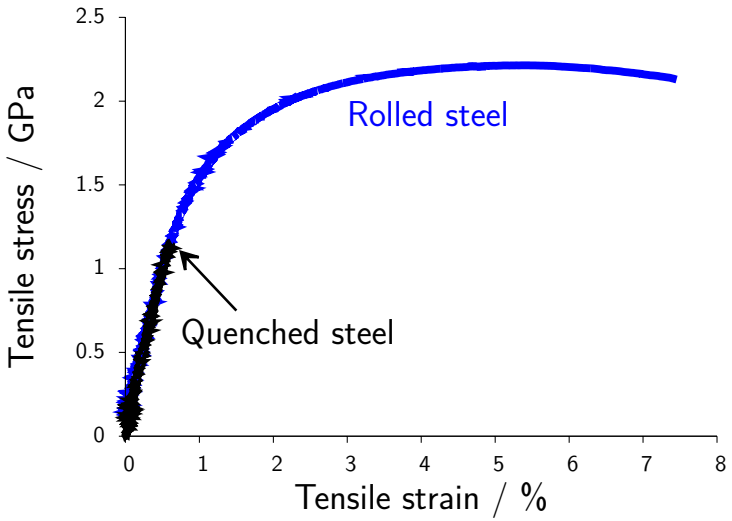


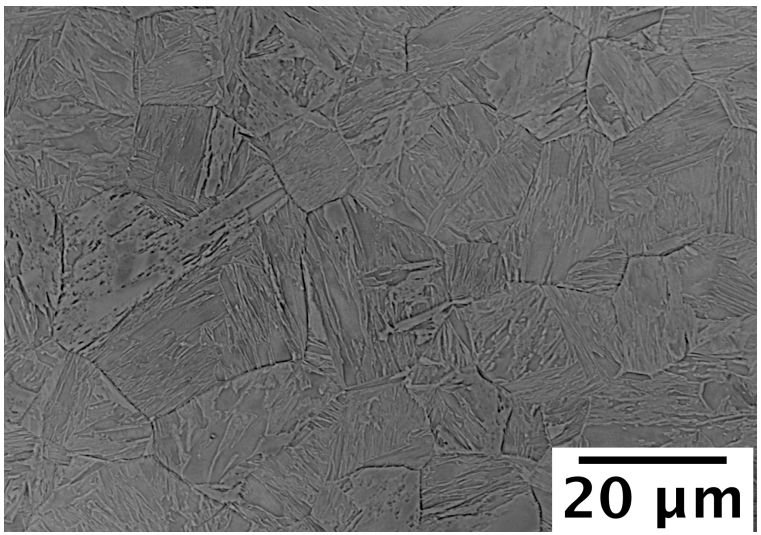


C < 0.35 and Cr + Ni + Si ≤ 7.0 wt%

Rolled steel: 561 ± 23 VHN

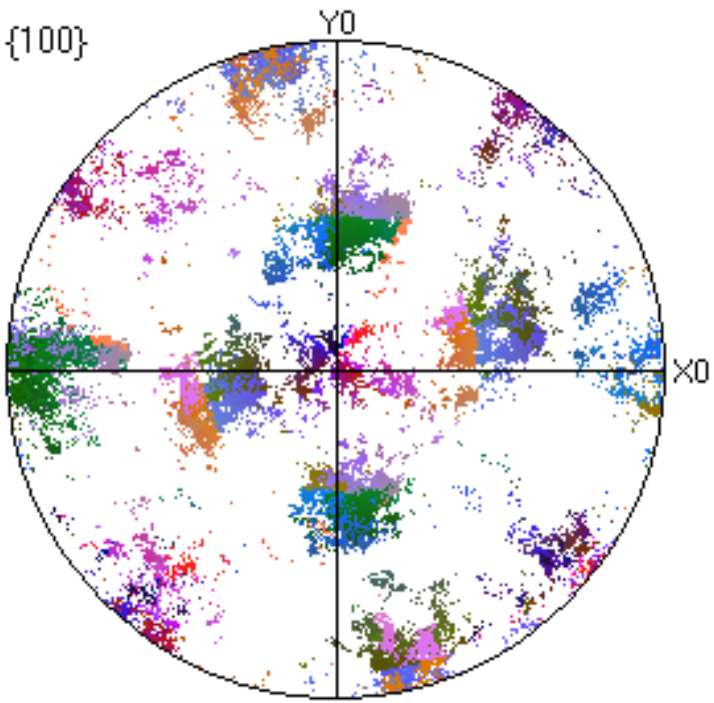
Conventional steel: Hard but not tough



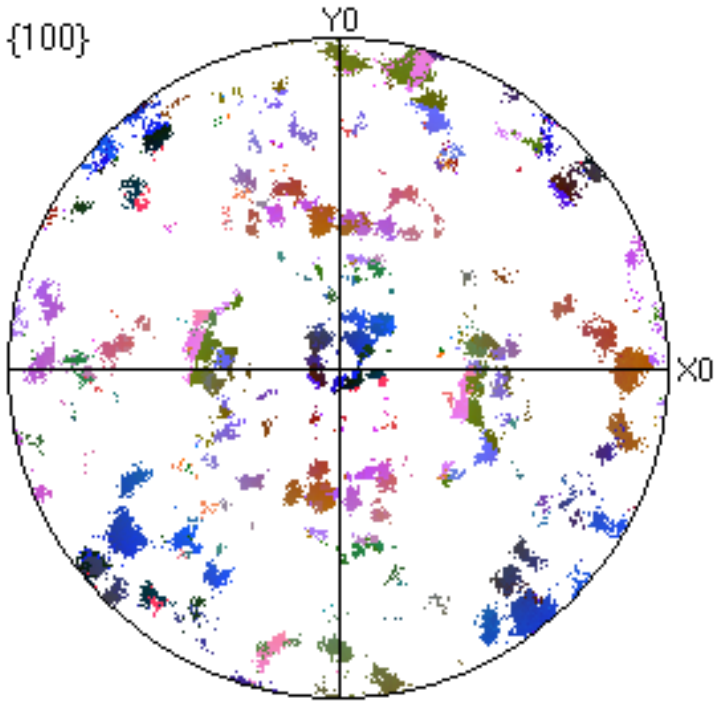


Quenched steel: 666 ± 8 VHN

High toughness *versus* Low toughness

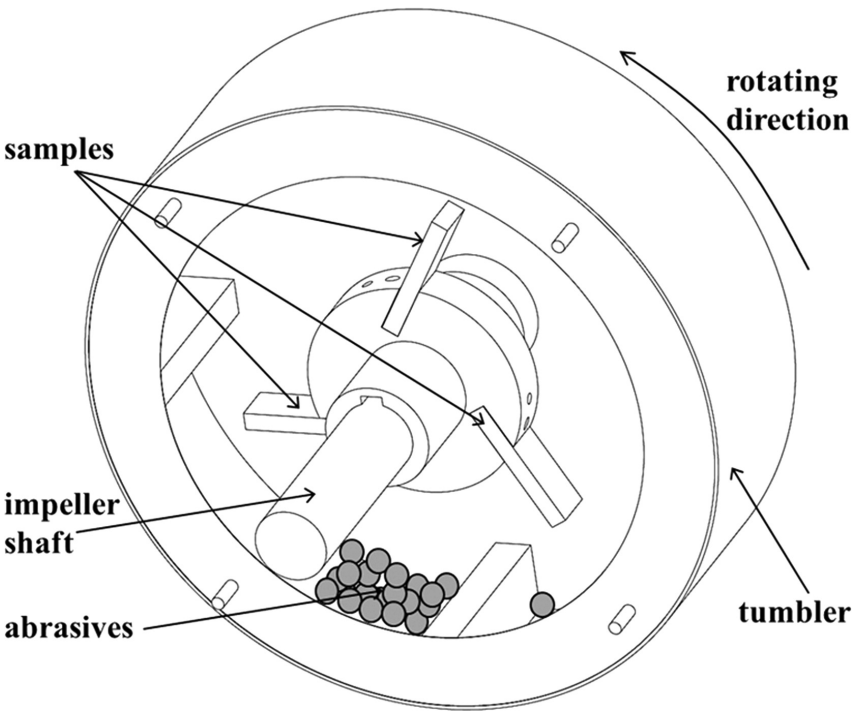


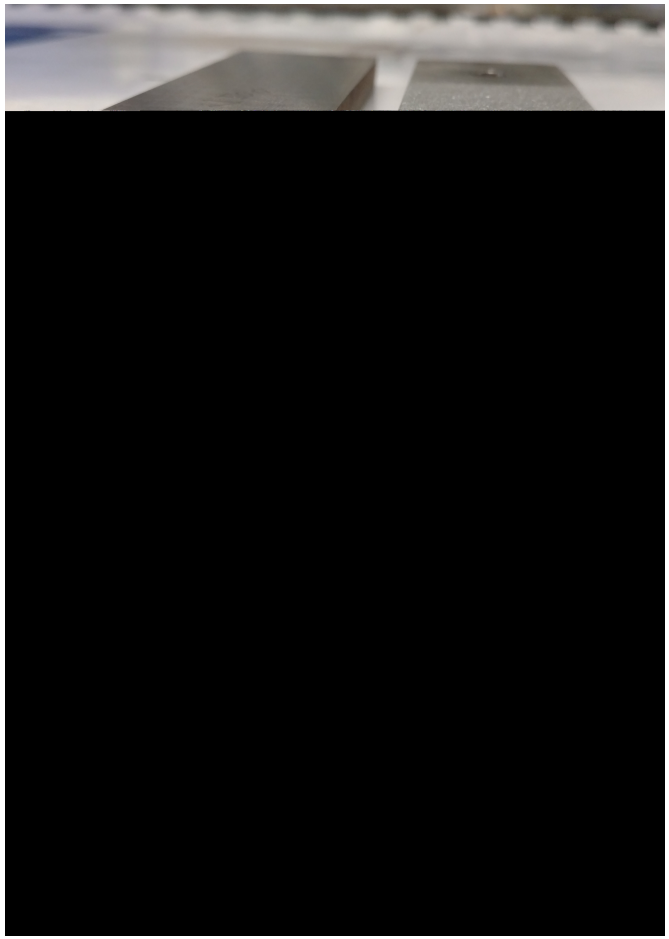
Rolled steel



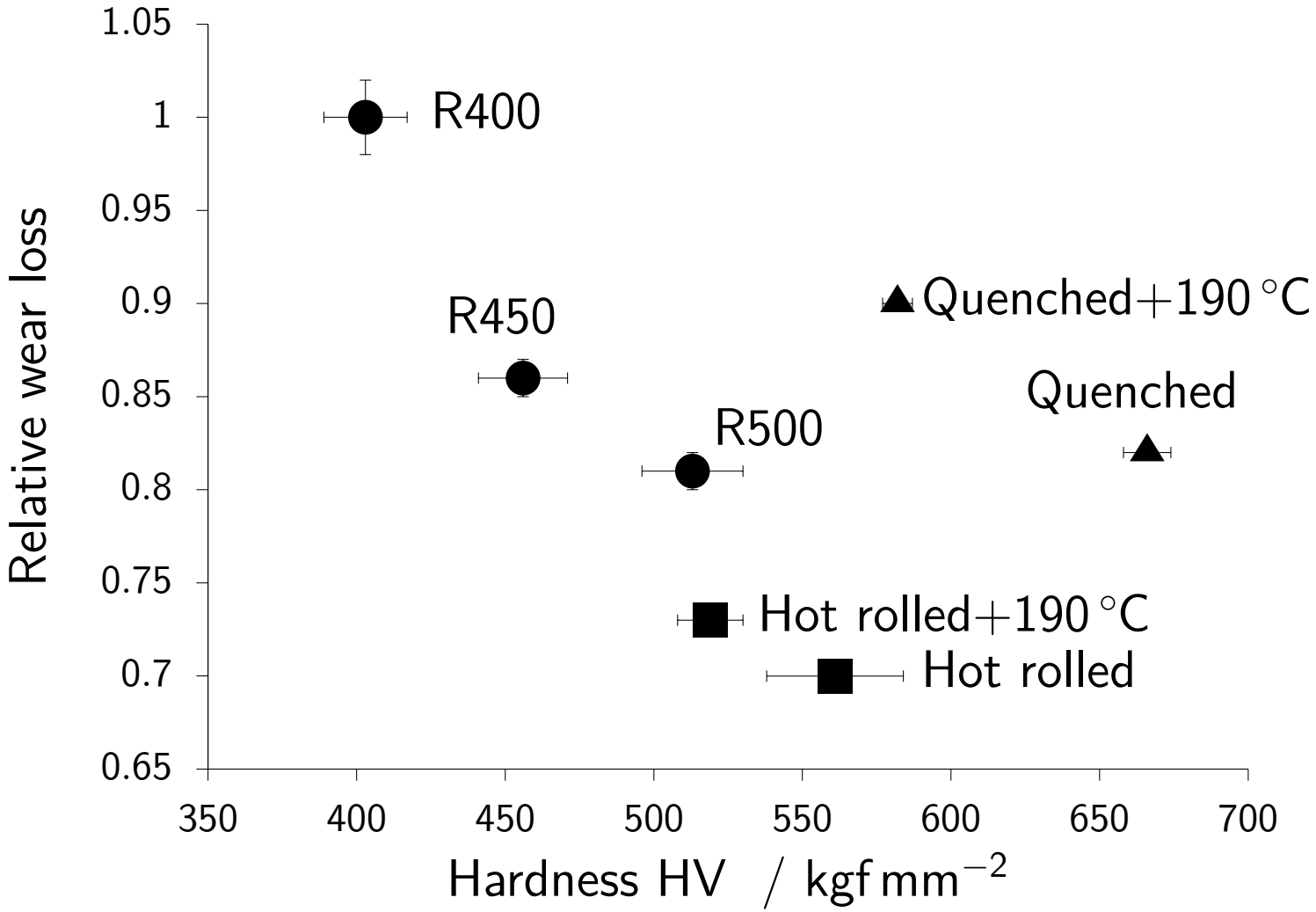
Quenched steel

Impact-abrasion wear test

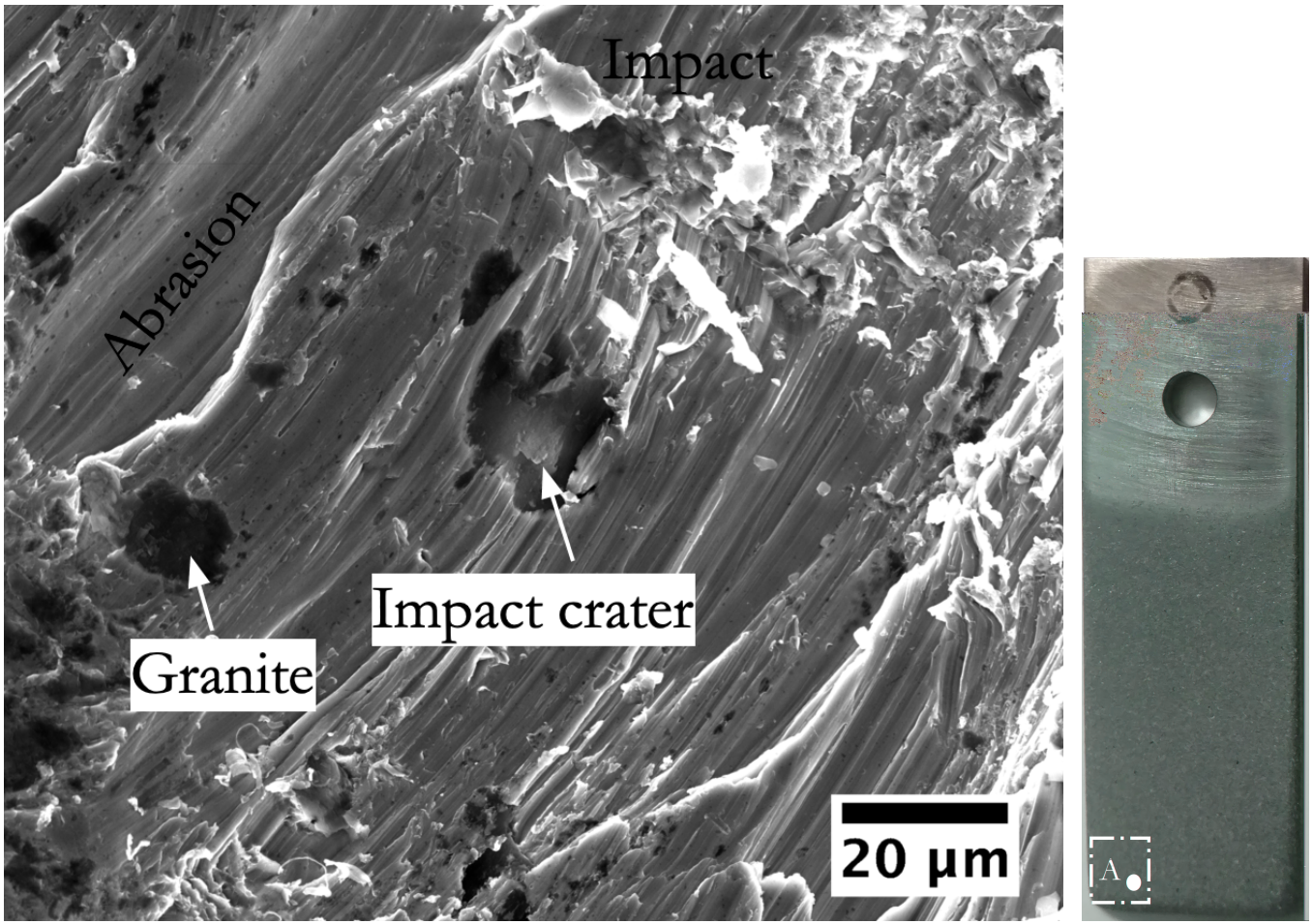




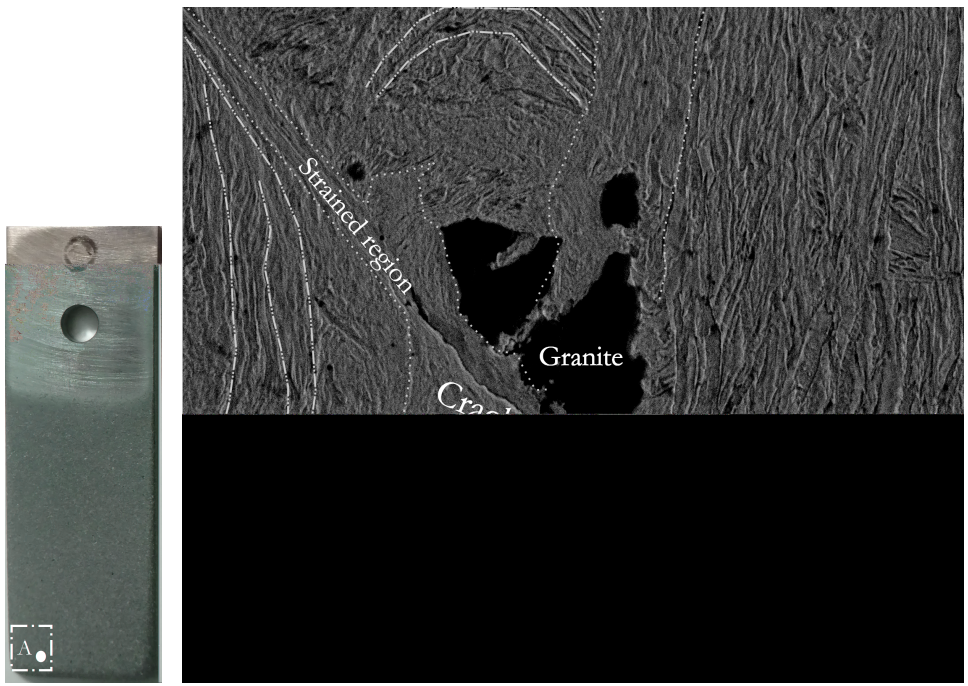
Results

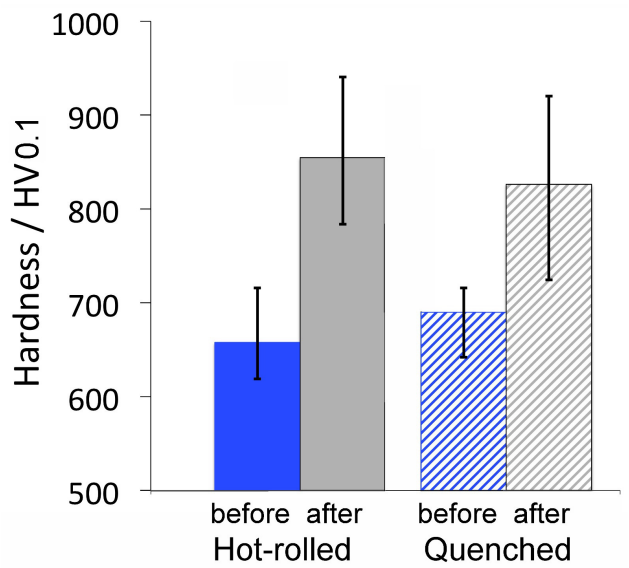

Relative wear loss
1.05
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
R400
R450
R500
Quenched+190 °C
Quenched
Hot rolled+190 °C
Hot rolled
350
400
450
500
550
600
650
700
Hardness HV / kgf mm^{-2}

Surface topography: Rolled sample

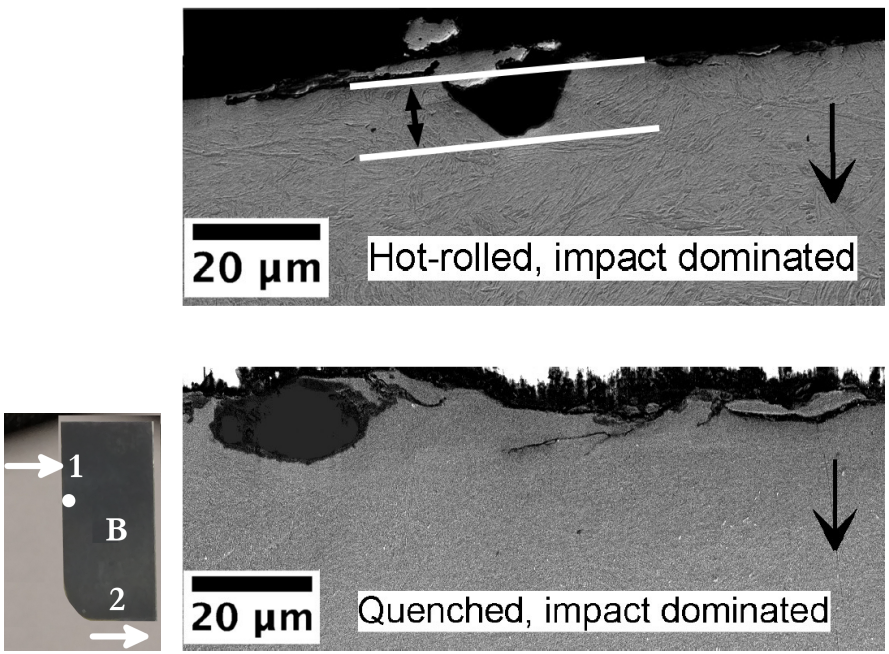


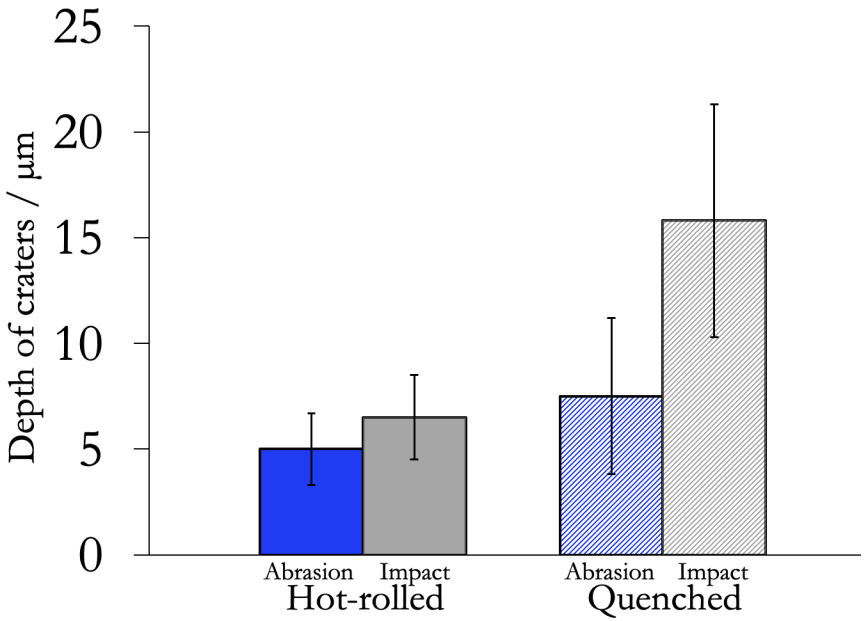
Subsurface topography: Rolled sample



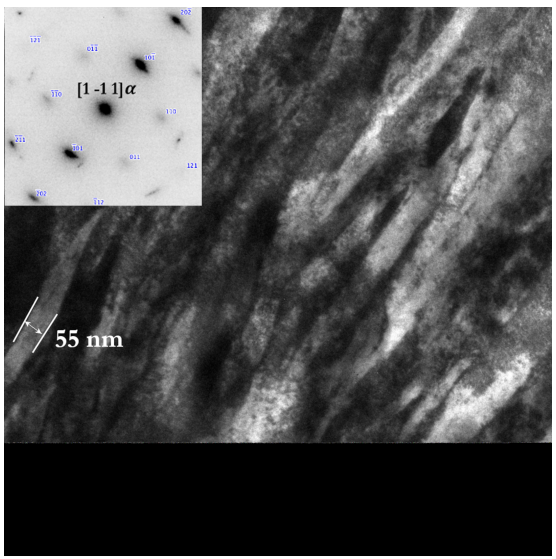


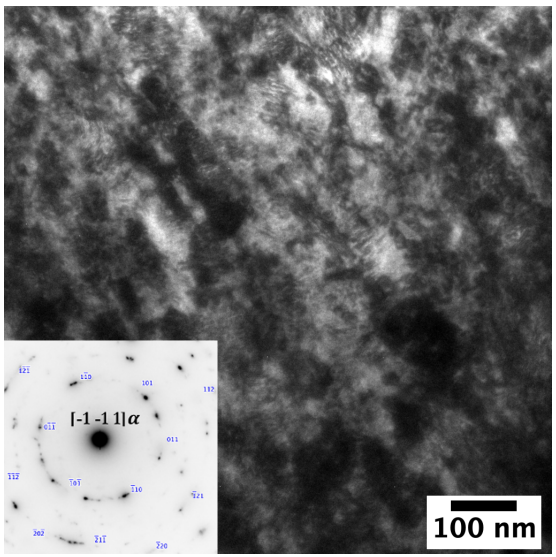
Cross-sectional microscopy



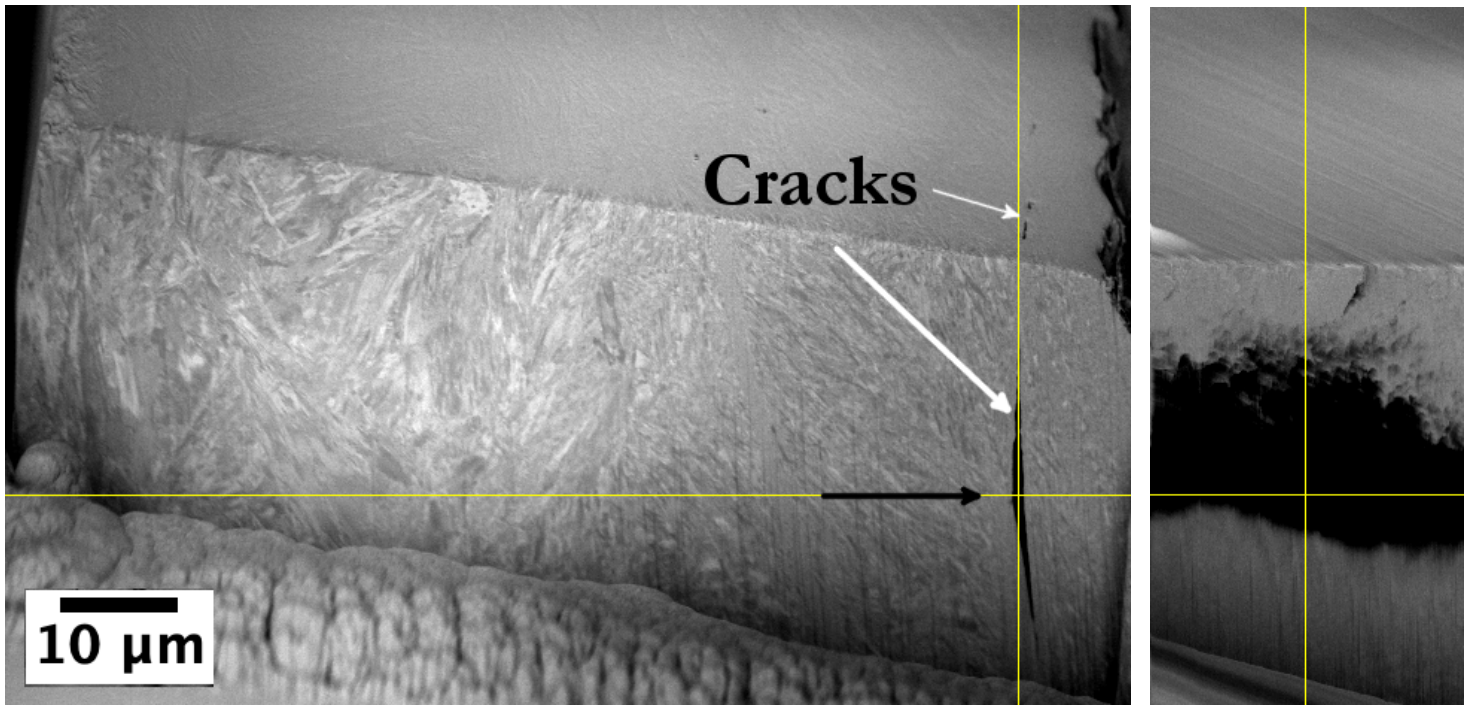


Subsurface: TEM

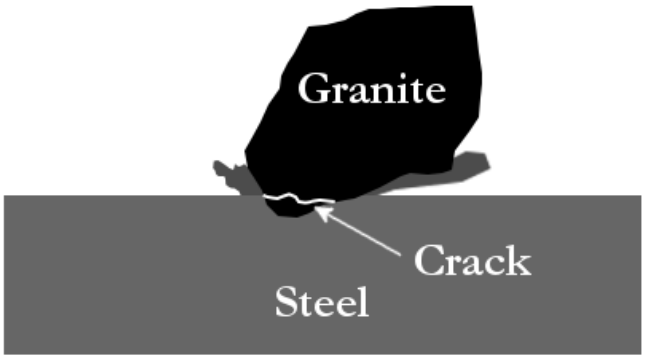


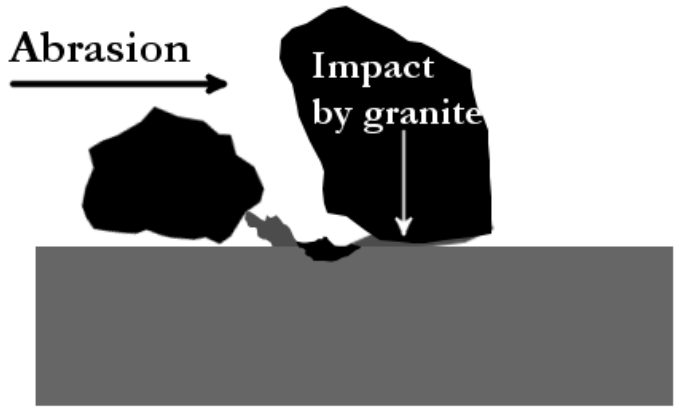


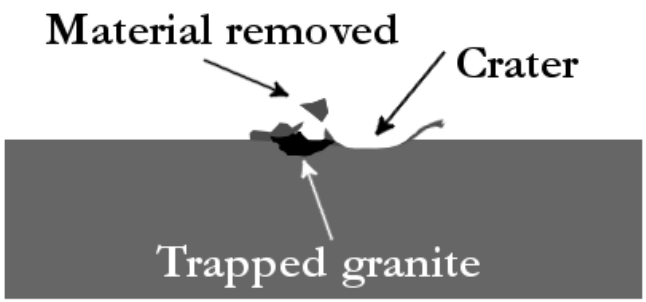
Subsurface: 3D SEM

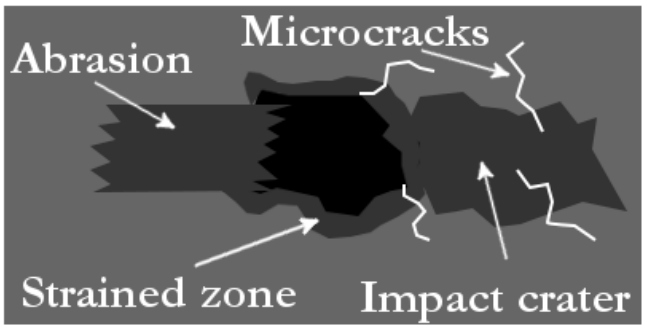


Impact-abrasion wear mechanism









Conclusions

- Role of toughness
- Impact-wear mechanism
- Further studies