Examination of CPM® MagnaCut Blade
Failed During Manufacture at Bark River

Requested by Bob Shabala

Niagara Specialty Metals

Report by: Gary Maddock

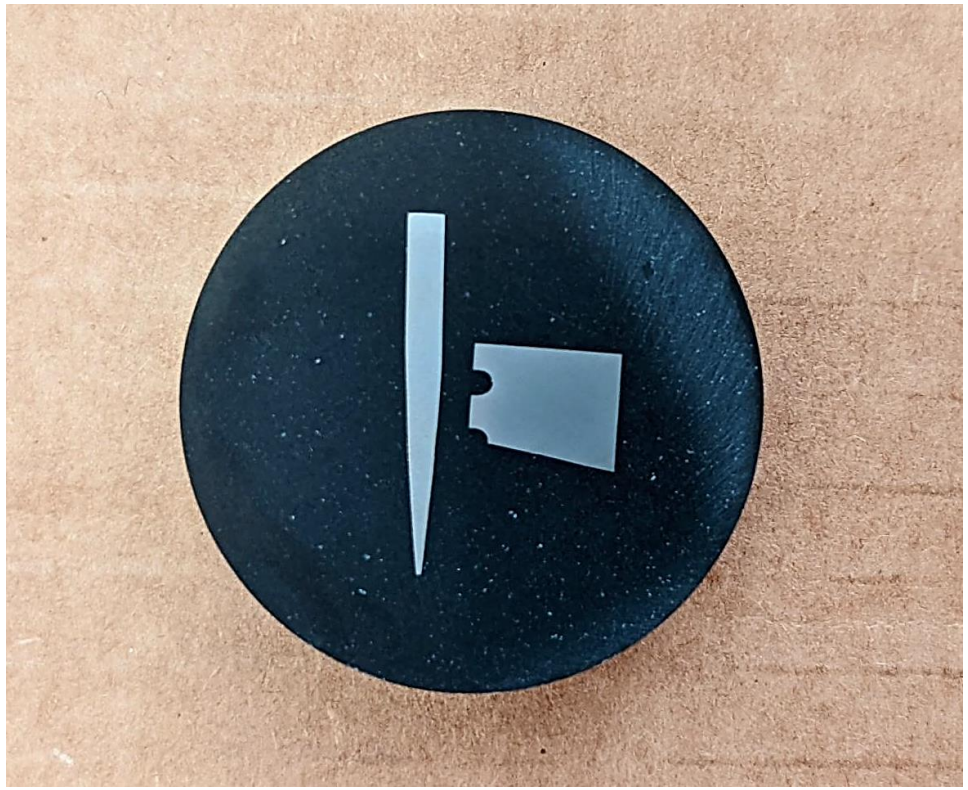
View of fractured blade as received for analysis

(blade exhibits primary ground bevel with unfinished edge)

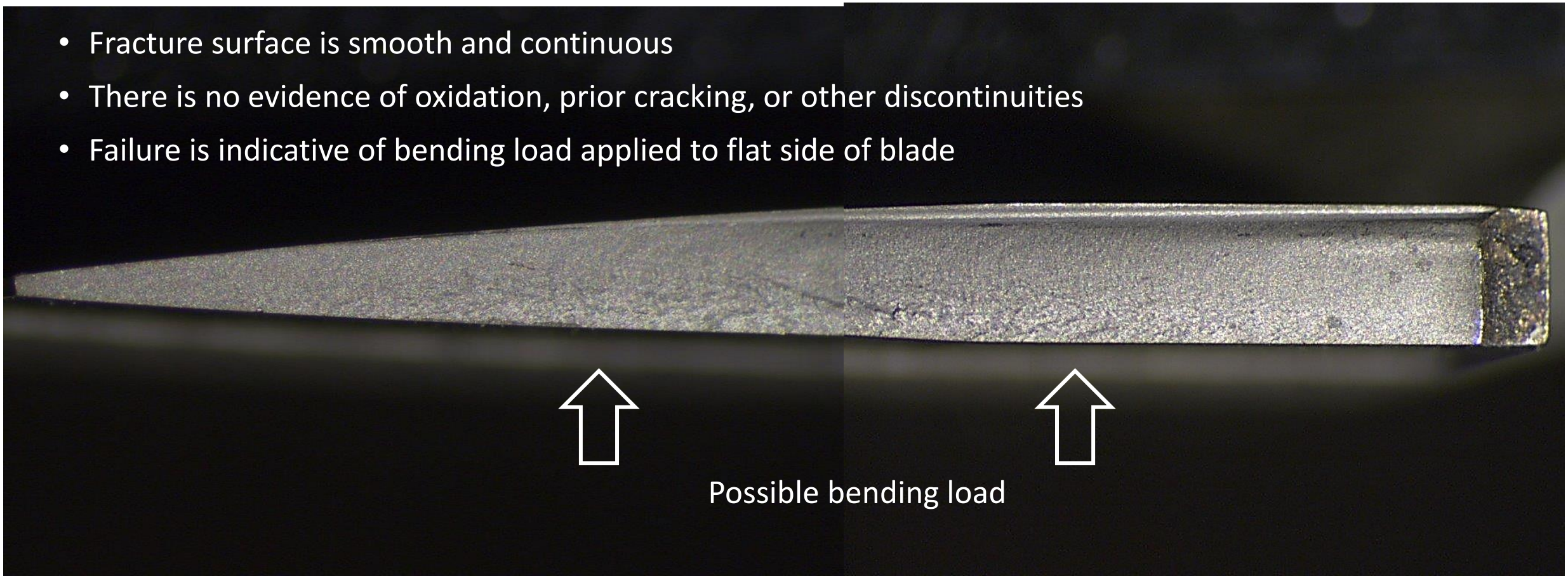
Close up of fracture:

- Blade surface is clean
- Fracture extends from jimping notch across blade in perpendicular fashion
- No evidence of mechanical damage on blade
- Macro hardness checks:
  - Blade- HRC 62.5-63
  - Handle- HRC 62.5-63

Specimen sectioned, mounted, and polished

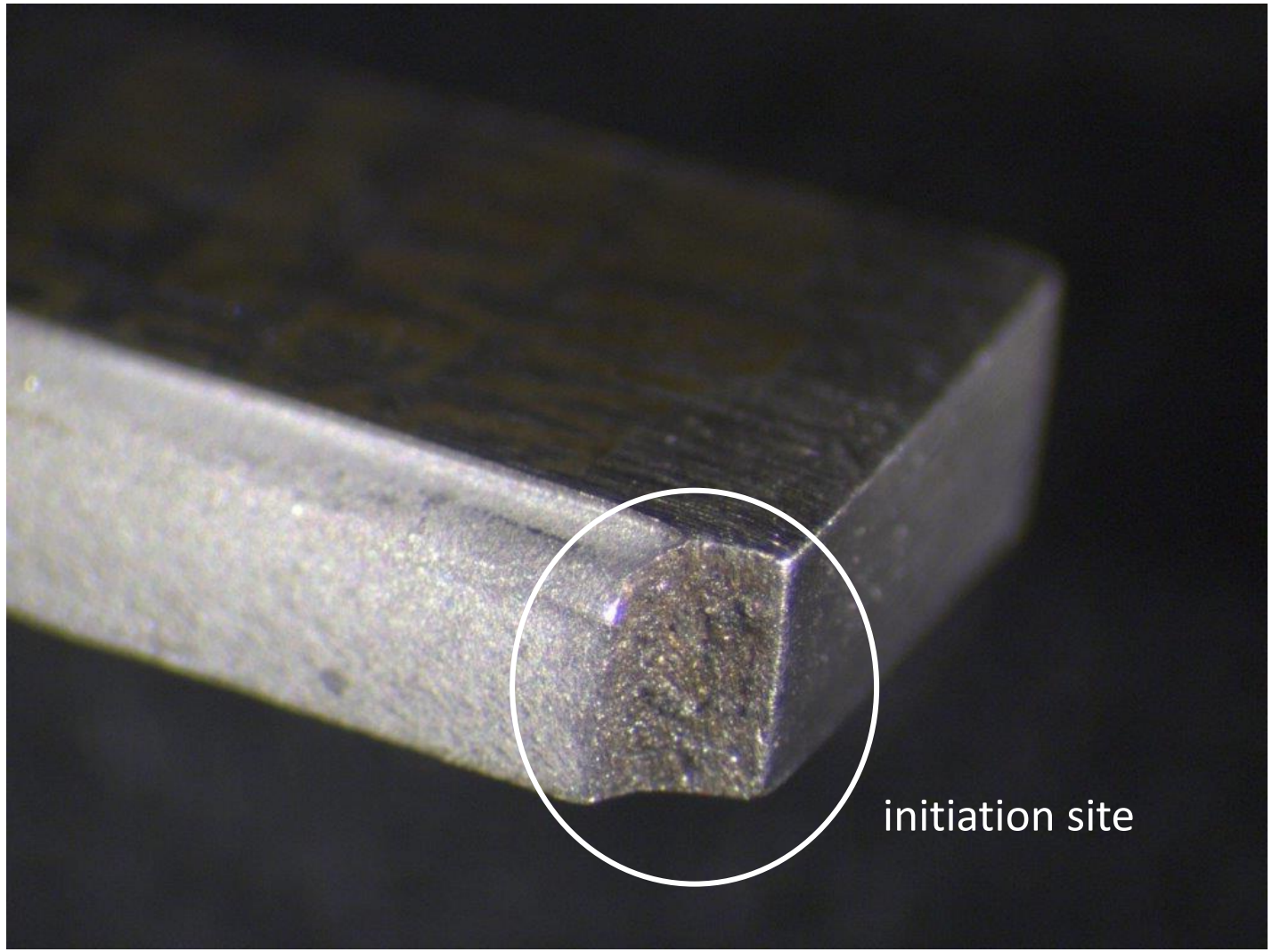


Composite view of fracture surface fracture.



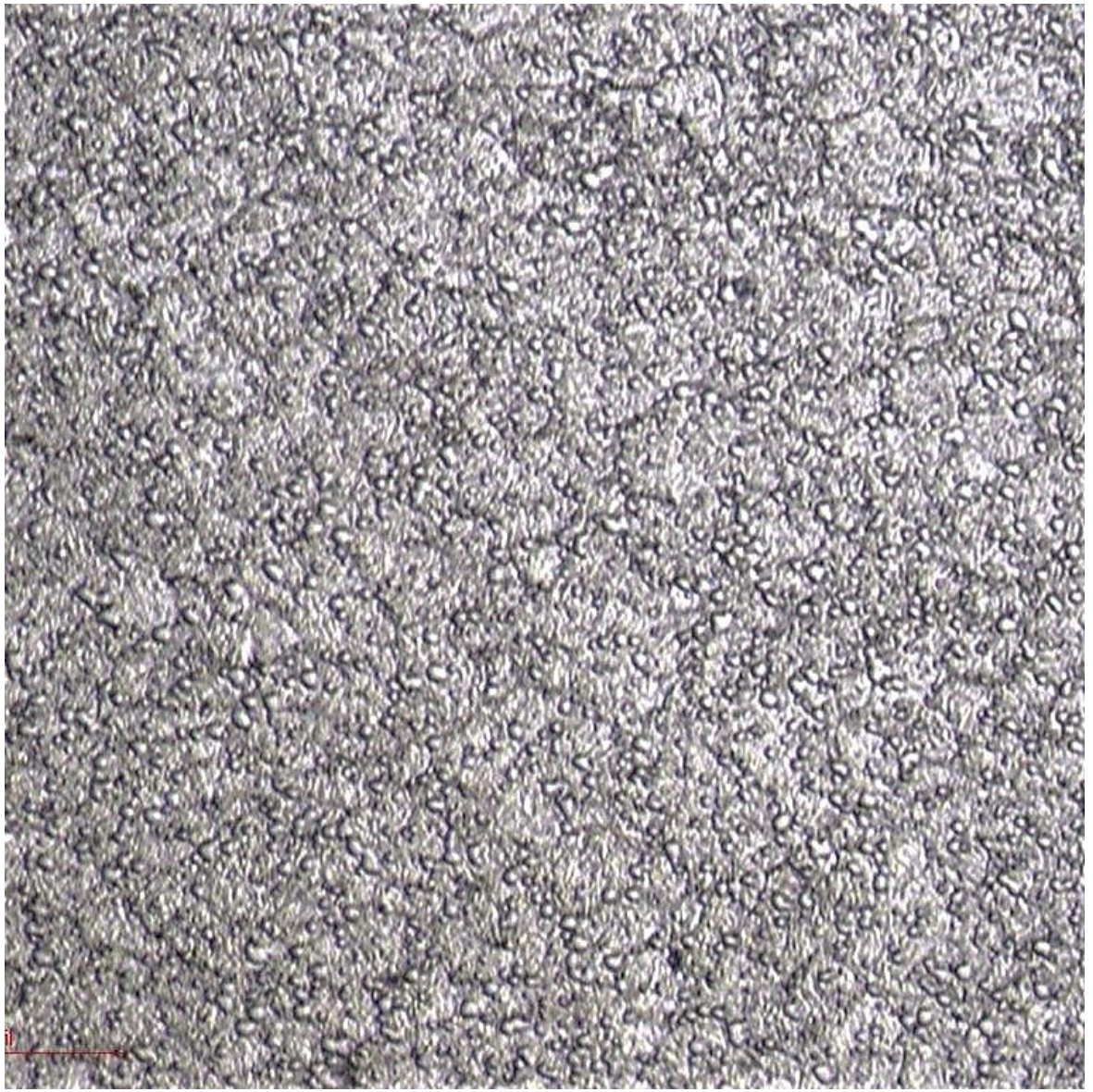
Macro view of corner:

- Rough surface evident within jimping notch
- Smooth fracture surface
- Bottom edge likely crack initiation site



General Microstructure
1000X Vilella's Etch

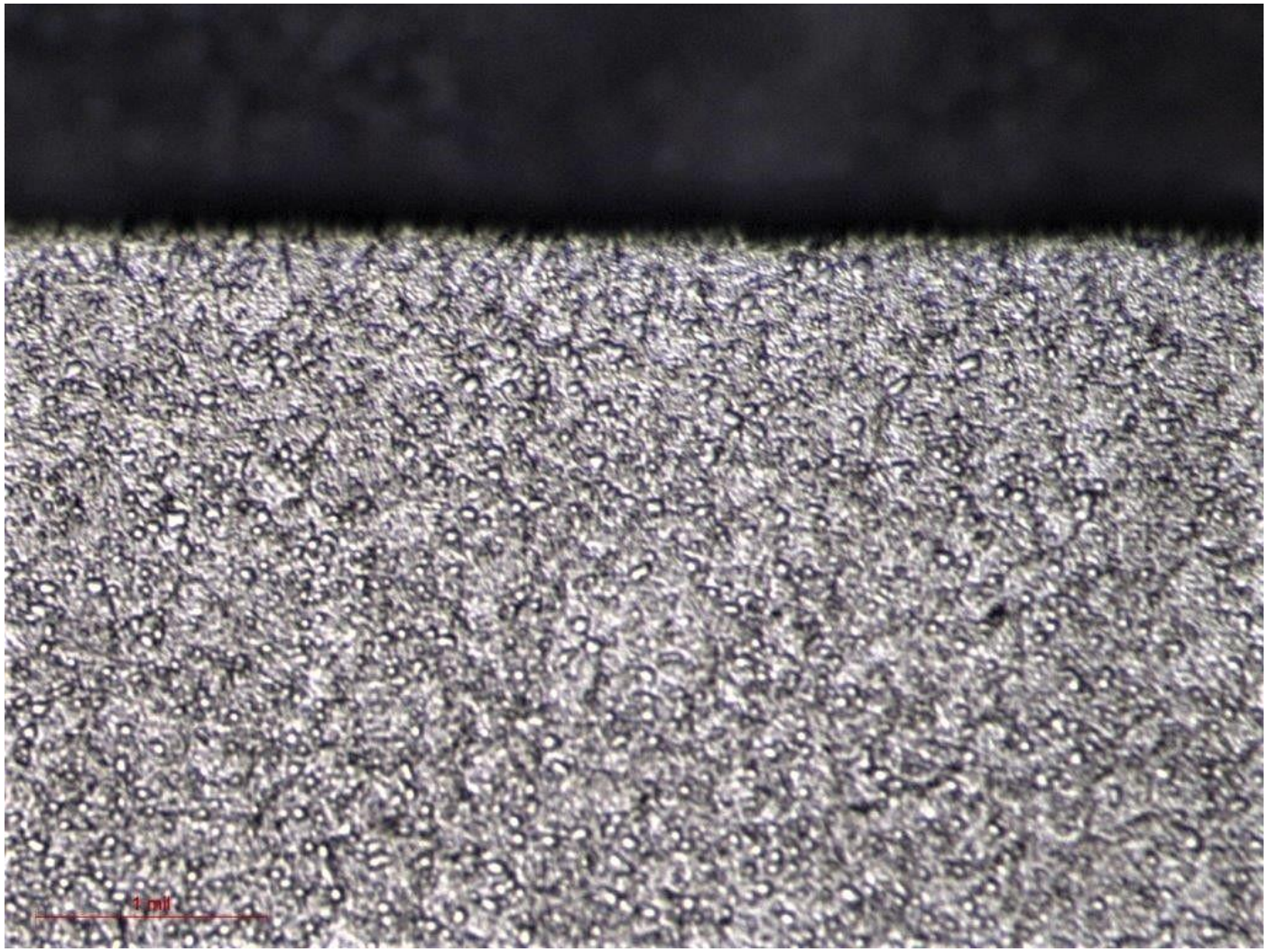
- Uniform dispersion of very fine carbide as expected for CPM MagnaCut Alloy
- No evidence of material defects
- Appears properly hardened and tempered



Transverse view at surface along primary ground bevel.

1000X Vilella's Etch

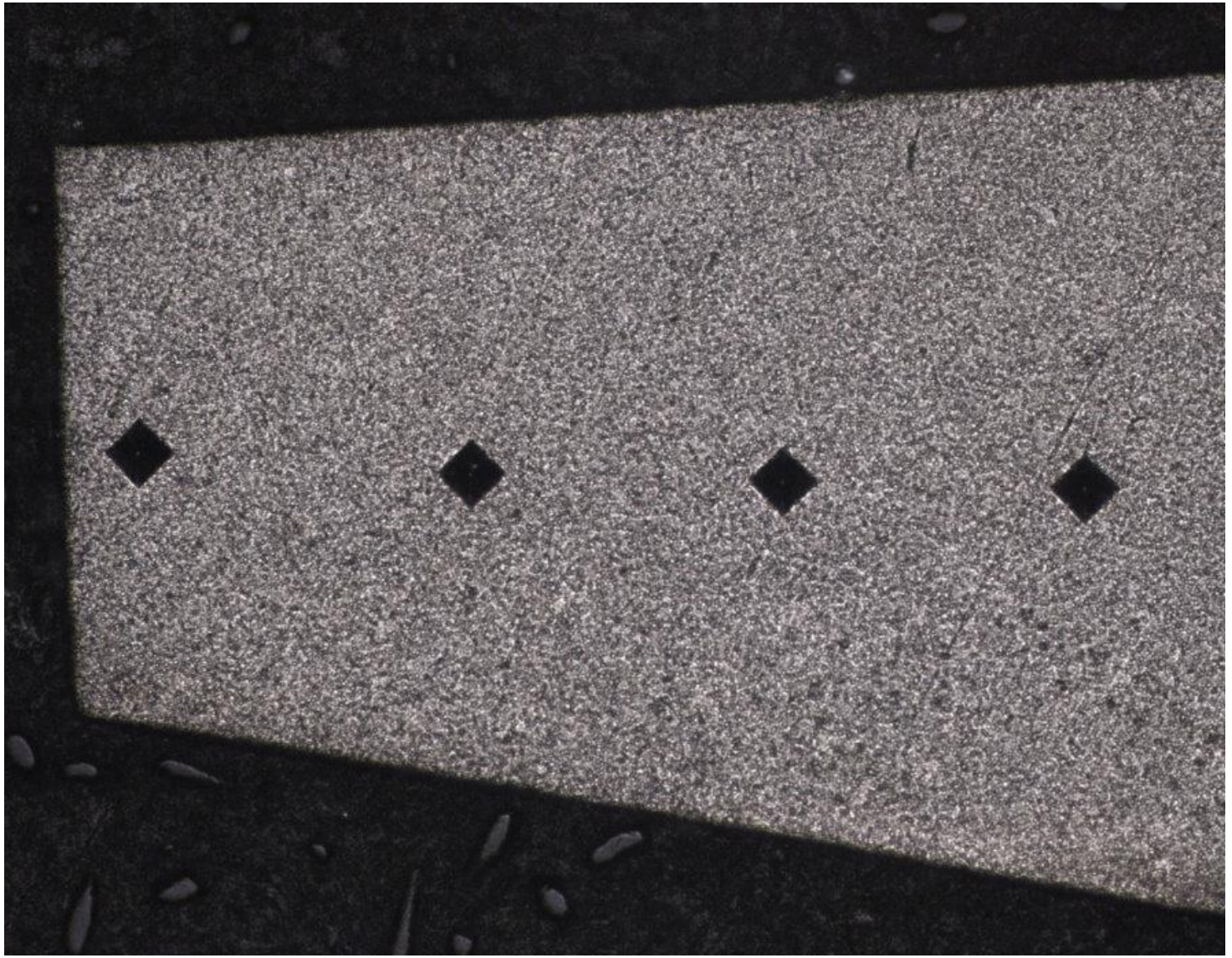
- Uniform structure along edge
- No evidence of thermal damage



Transverse view of unfinished cutting edge

50X Vilella's Etch

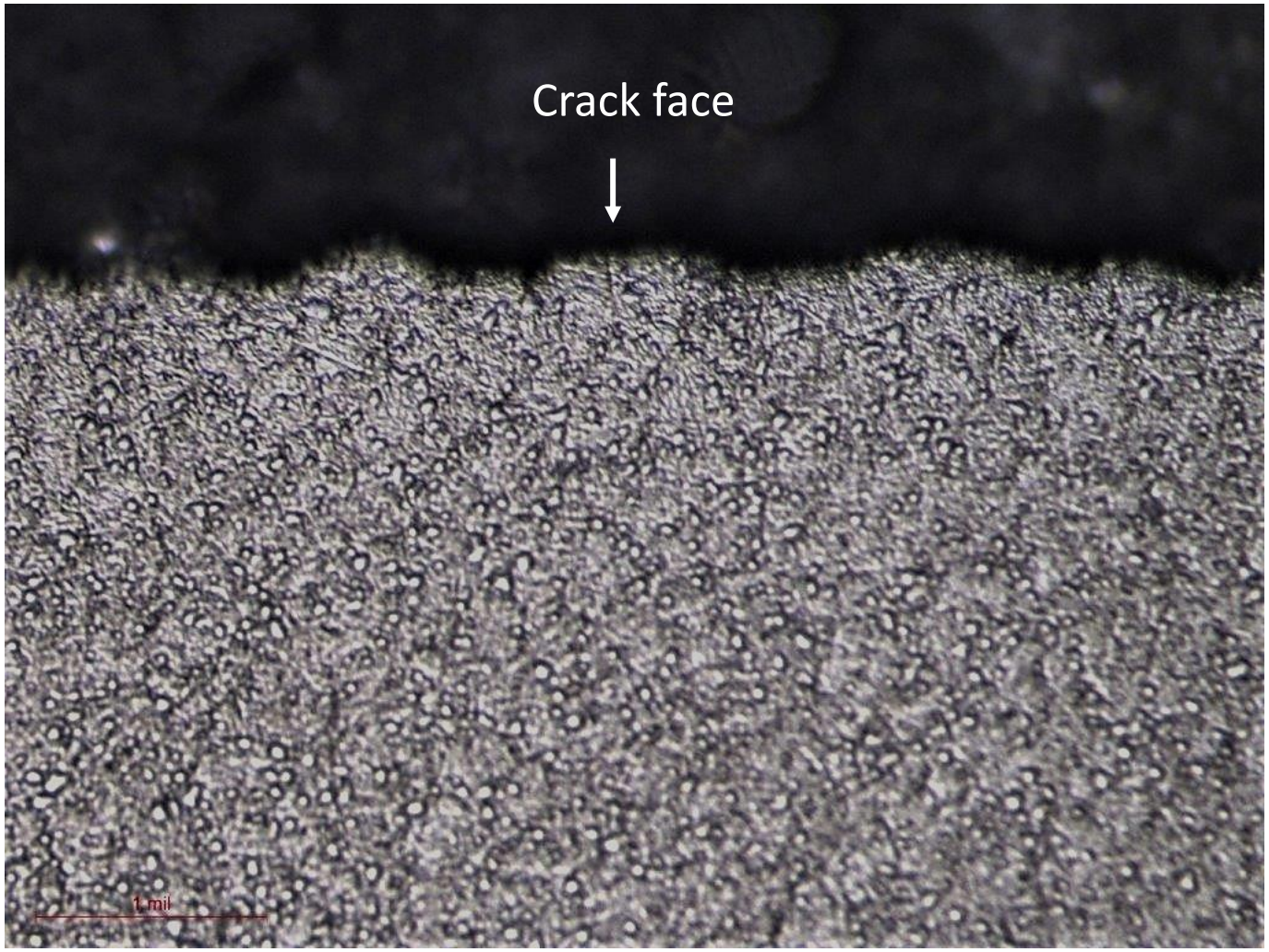
- Surface integrity appears very good
- Consistent microhardness found along blade edge and cross section:
  745-779 HV (=RC 61.9-63.2)



View looking down at edge of crack face

1000X Vilella's Etch

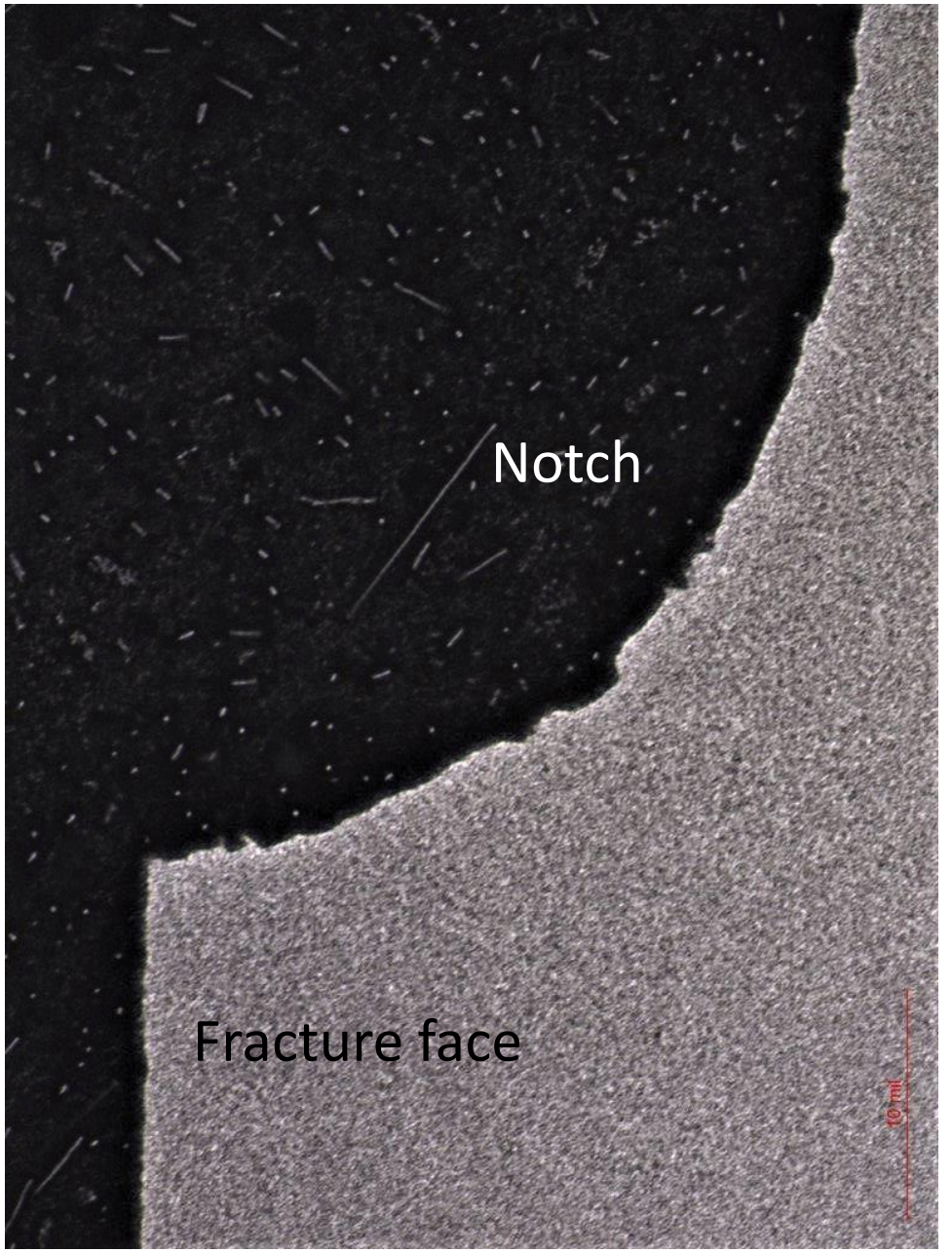
- Fracture appears transgranular in nature with minimal plastic deformation
- Microstructure appears normal along crack face
- Limited ductility evident in fracture behavior is typical given the alloy content and hardness of the blade material



View looking down on jimping notch/crack intersection

100X Vilella's Etch

- Rough surface noted in jimping
- No evidence of thermal damage



Higher mag view of jimping notch/crack intersection
500X Vilella's Etch

- Rough surface in jimping may have accentuated (stress riser) notch effect
- Microstructure appears normal under surface