



Lockpicking Forensics

datagram
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Black Hat USA Briefings, 2009

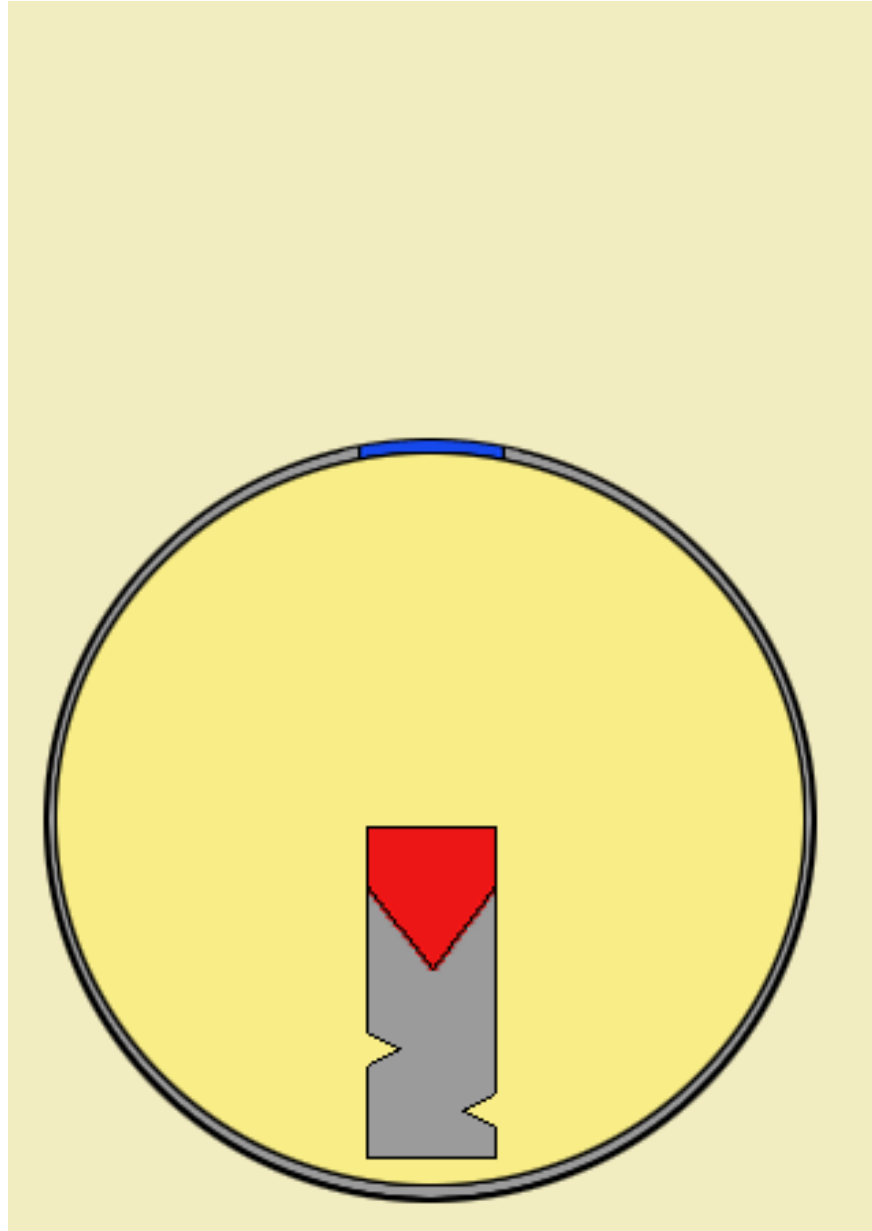
Agenda

- How locks/picks work
- Normal wear
- Lock Analysis
- Key Analysis
- Investigative process

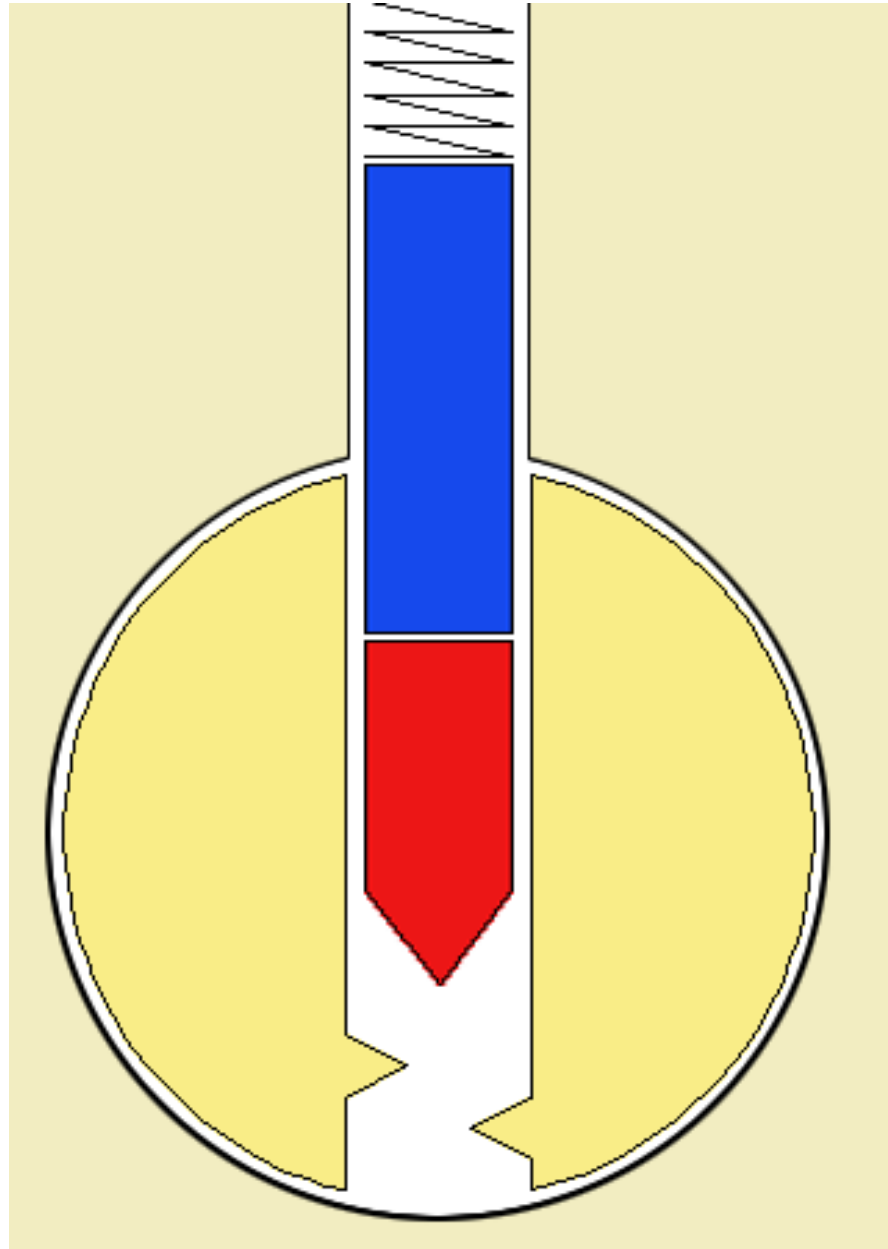
Destructive entry still #1!



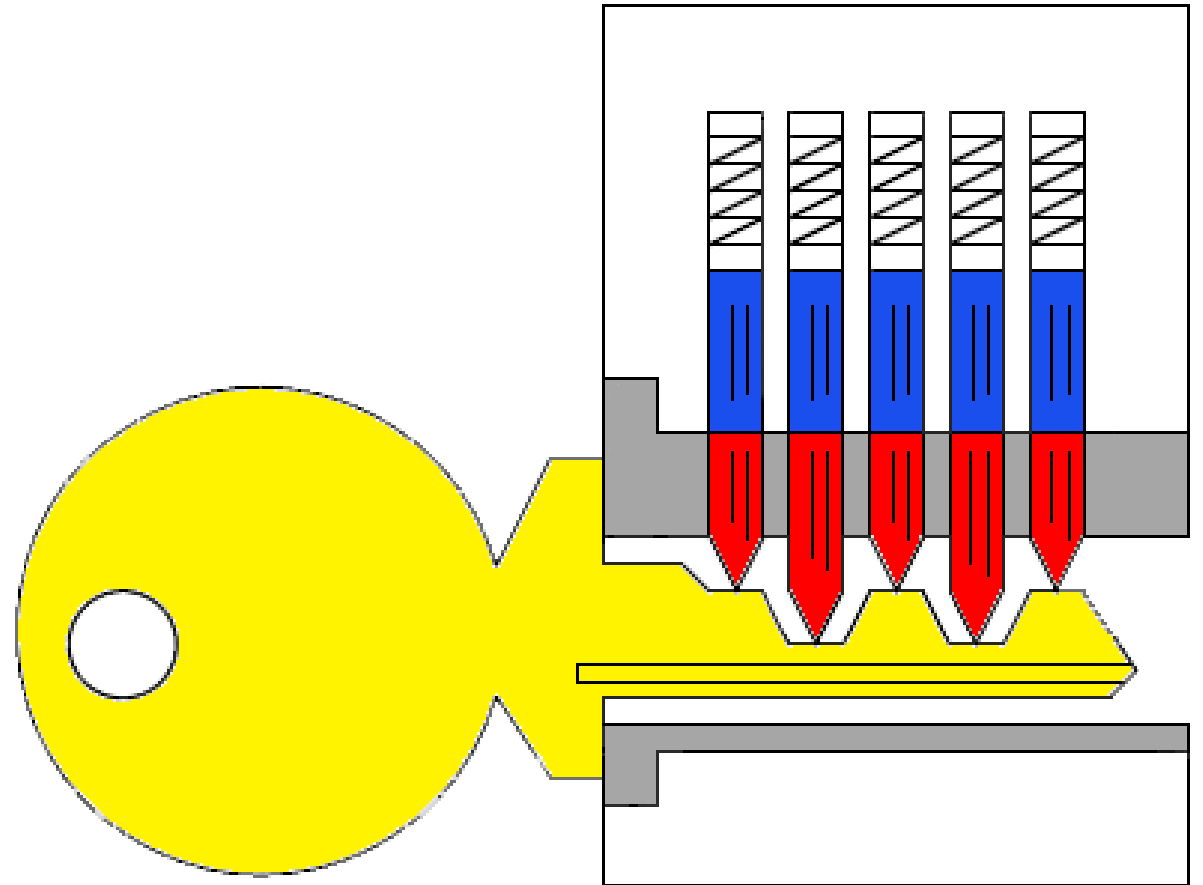
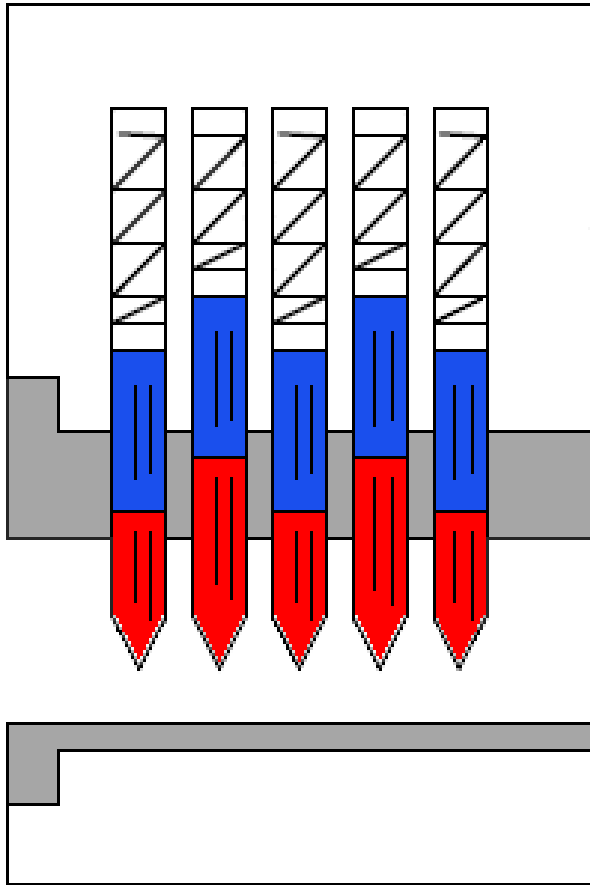
How Locks Work



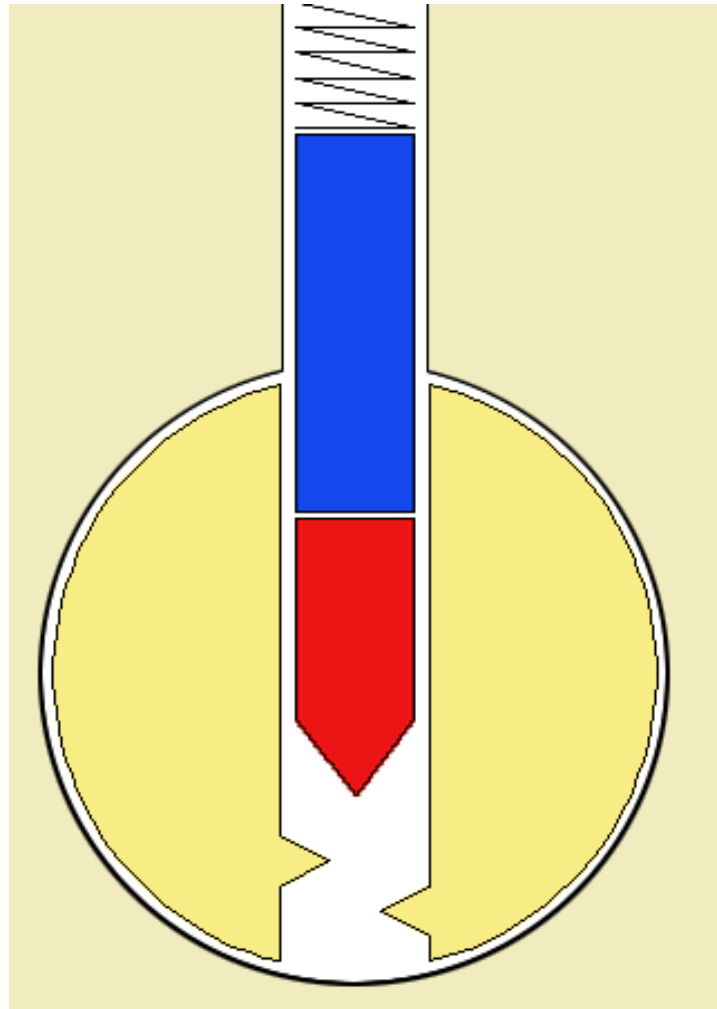
How Locks Work



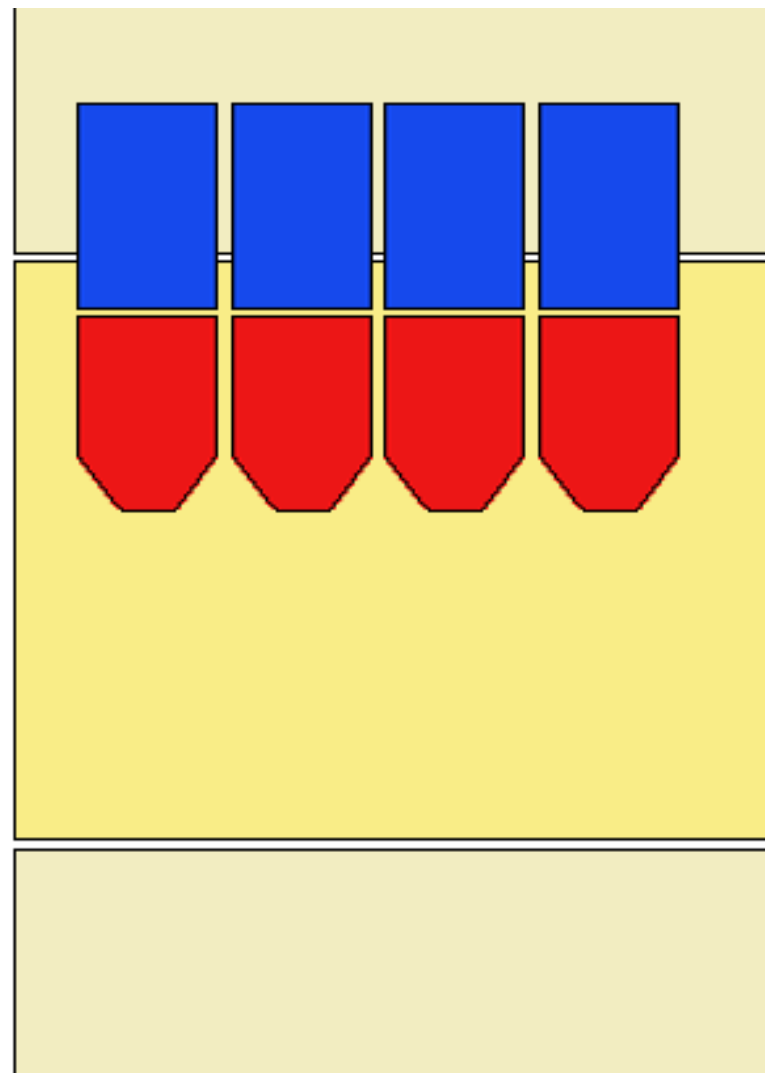
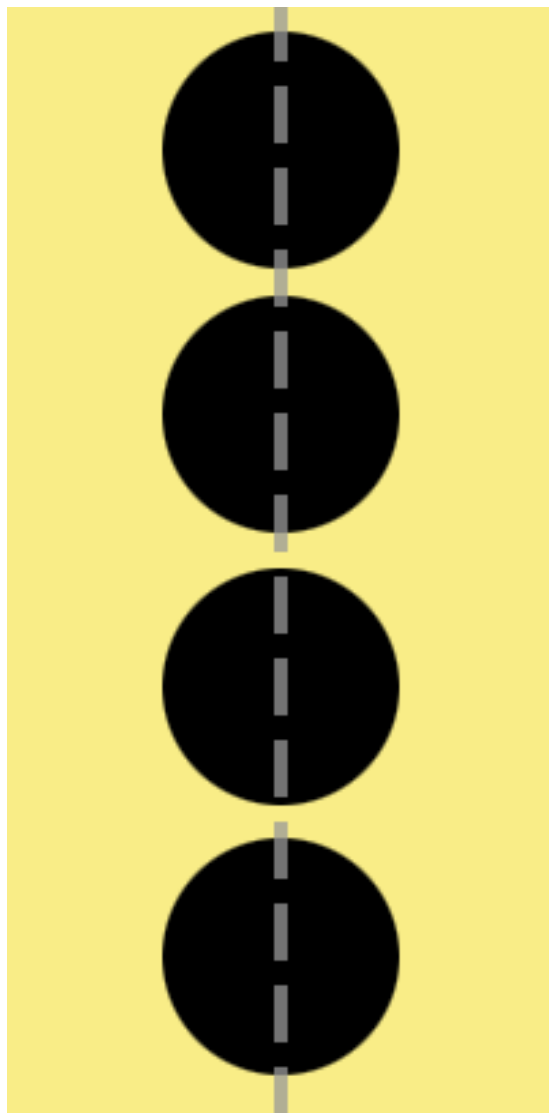
How Locks Work



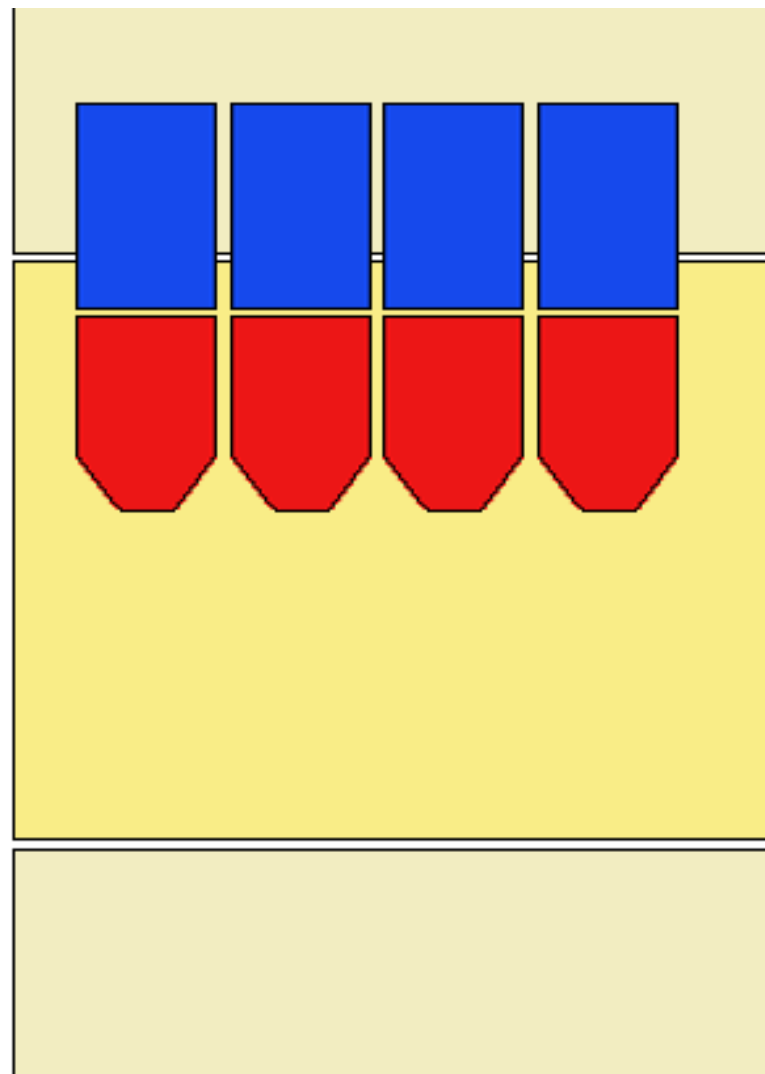
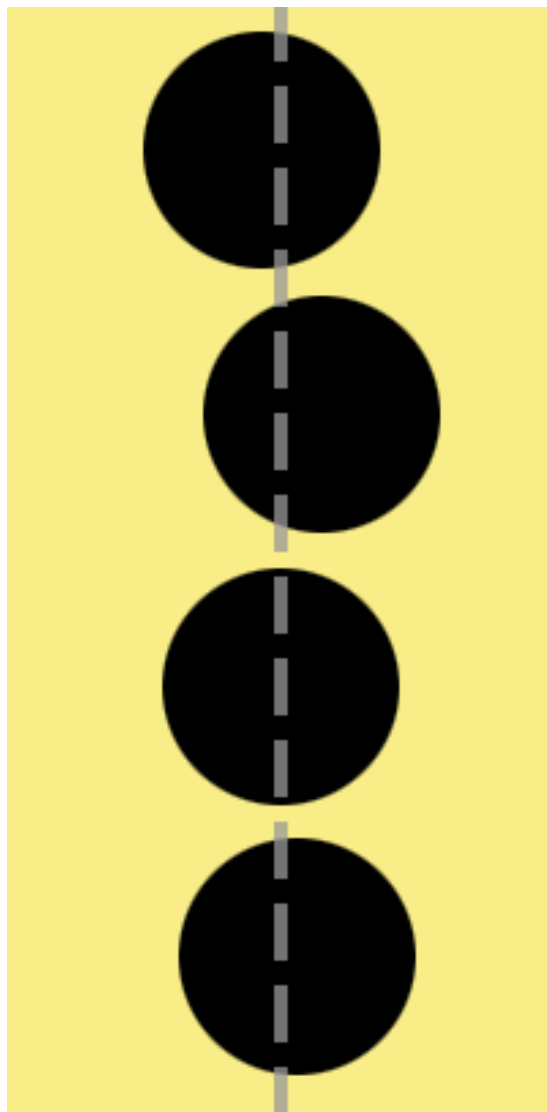
How Locks Work



Pin Binding



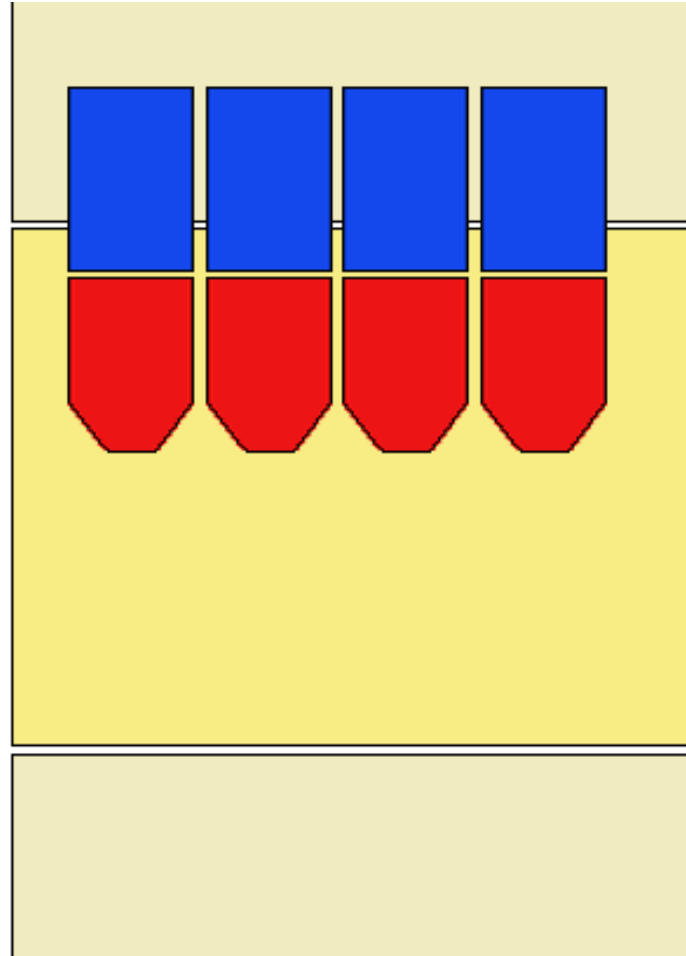
Pin Binding



Picking a Lock

- Apply tension
- Find binding pin
- Raise to shear line
- Repeat

Picking a Lock



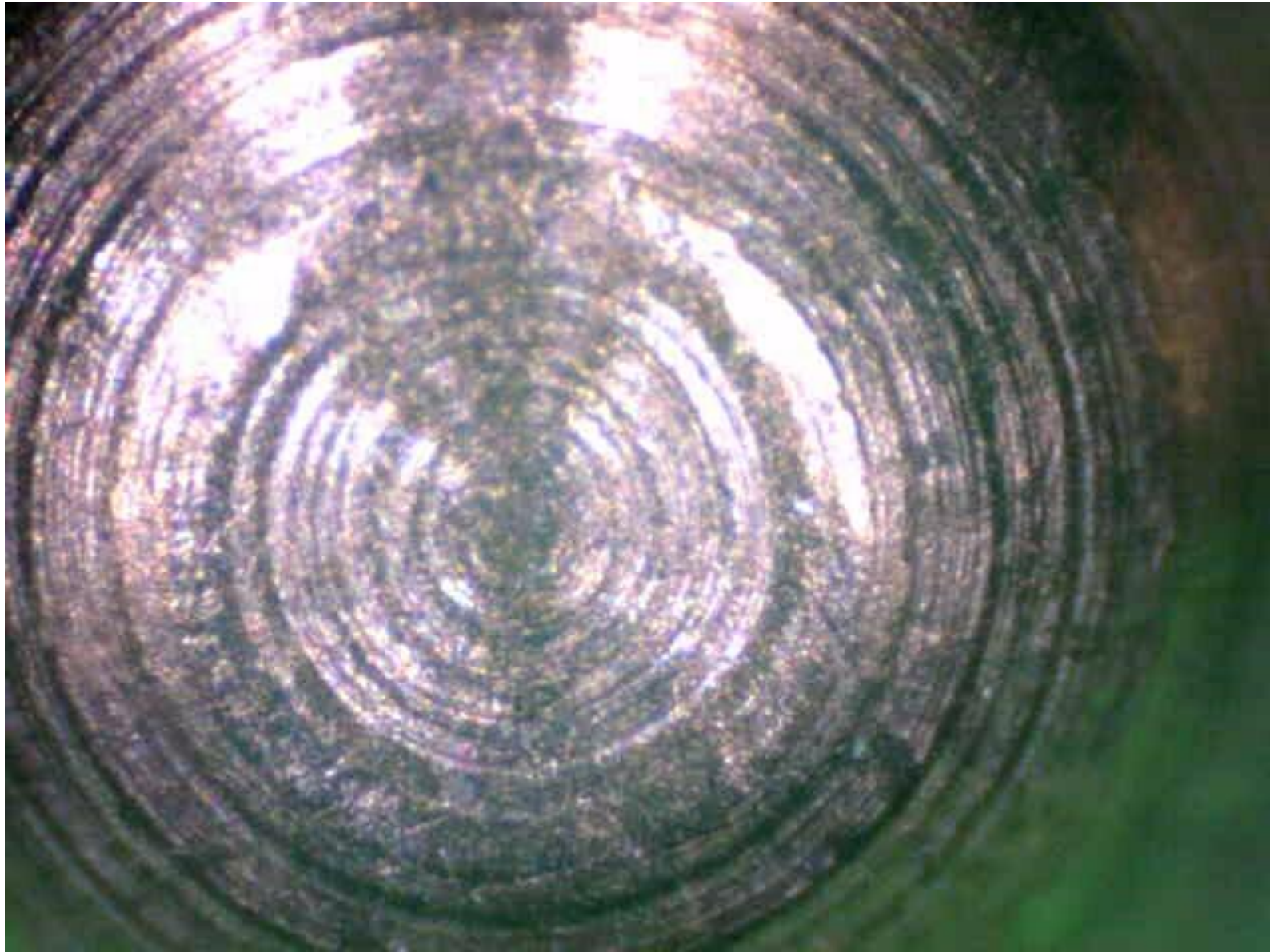
Forensic Locksmithing

- 1976 - Art Paholke, Chicago PD
- Locks, Safes, Security (Tobias)
- Werkzeugspur (Goth)
- Impressioning (Diederichsen)
- Determine method of entry
- Identify evidence, tool marks, techniques
- Provide expert testimony

Pins – New



Pins – New



Key - New



Plug - New



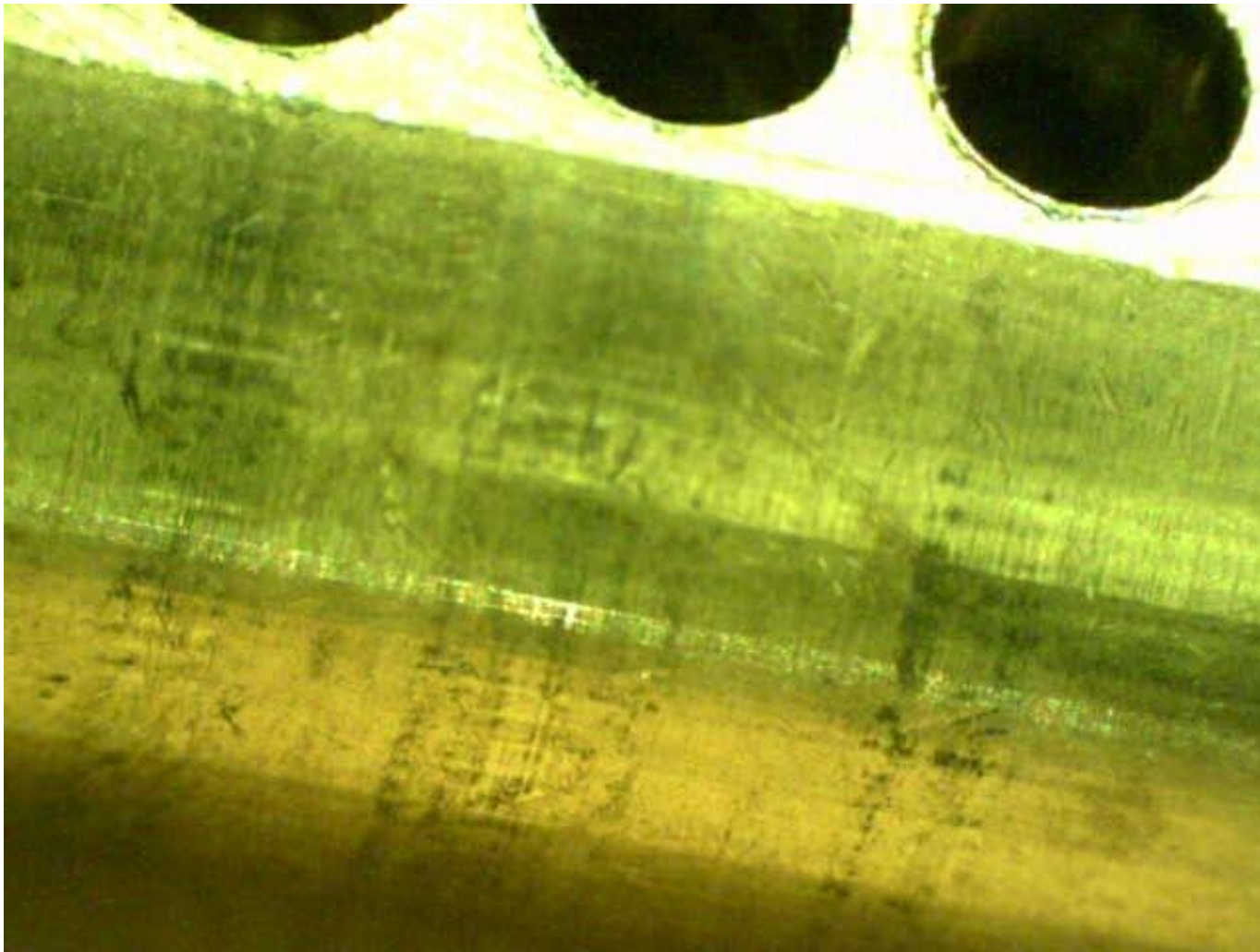
Pins – 100 uses



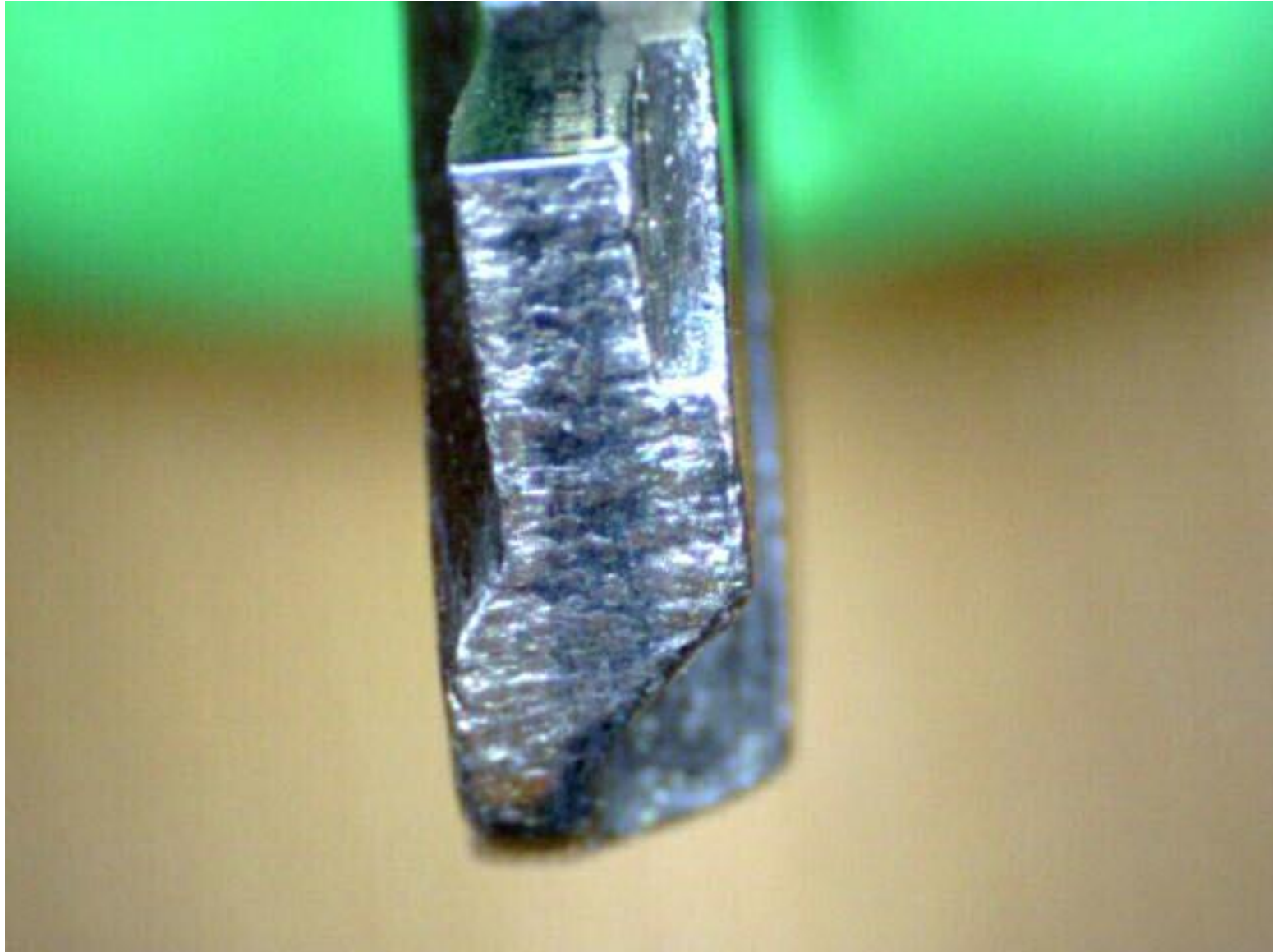
Pins – 100 uses



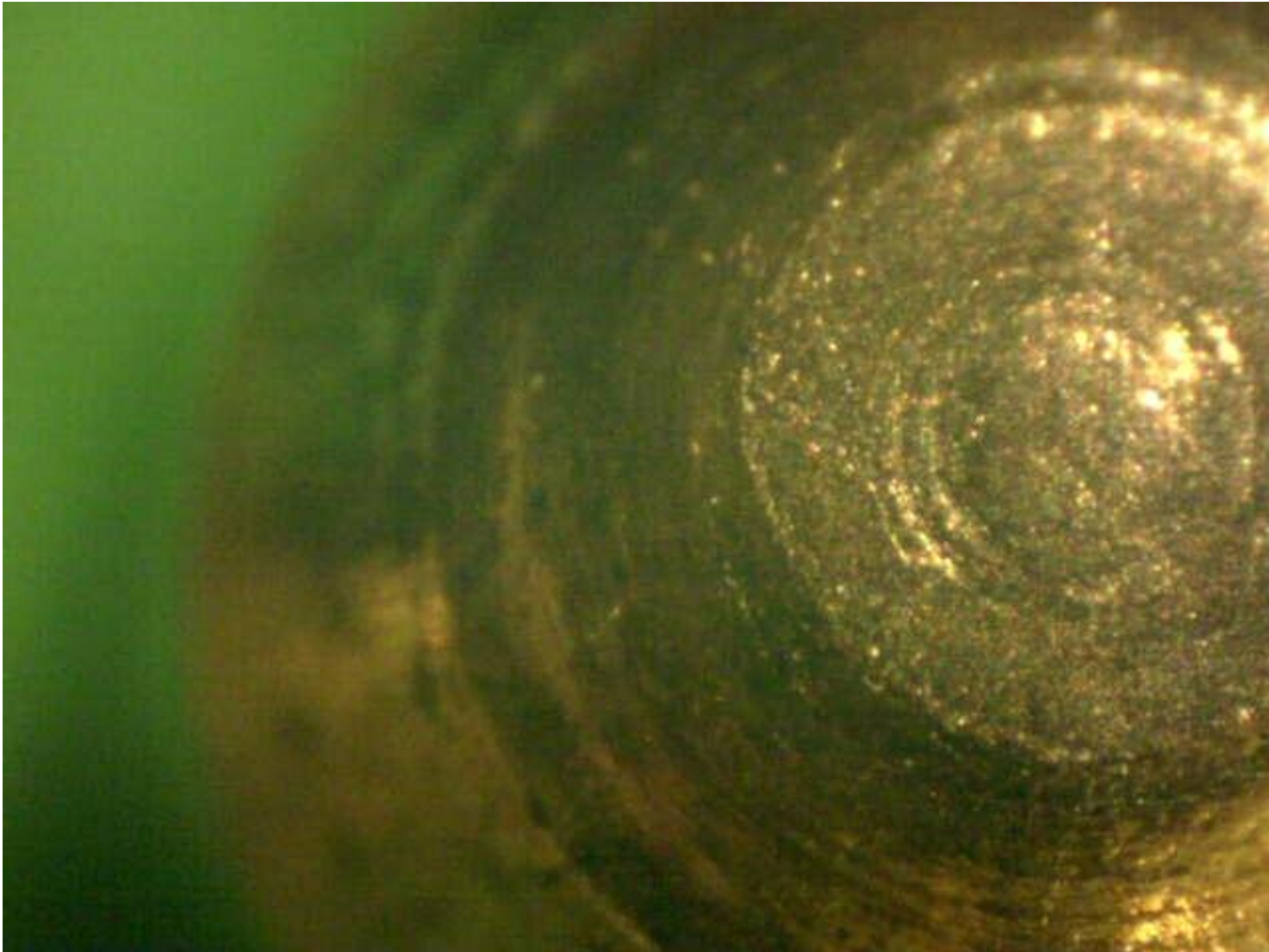
Plug – 100 uses



Key – 100 Uses



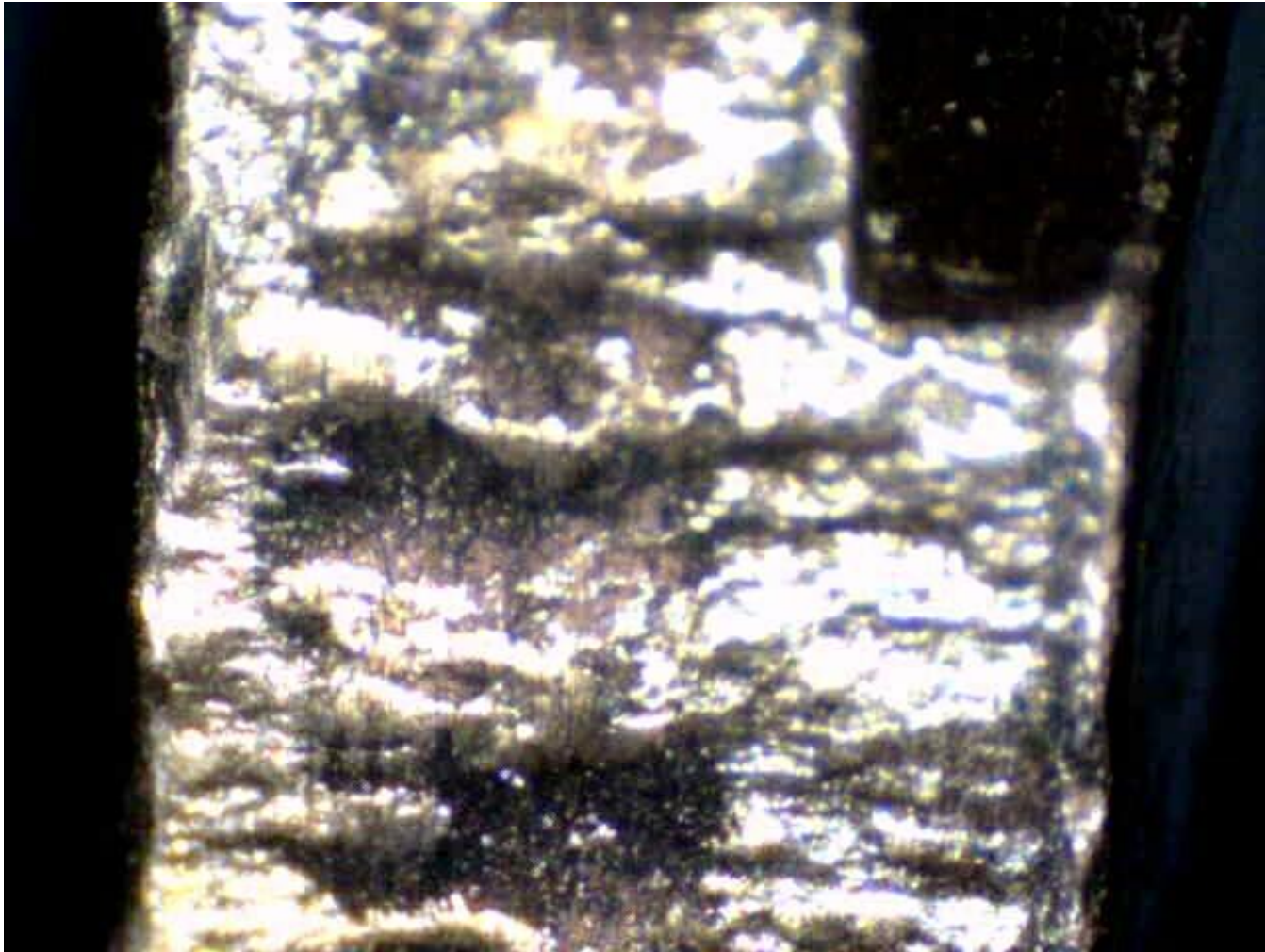
Pins – 1,500 uses (pin 1)



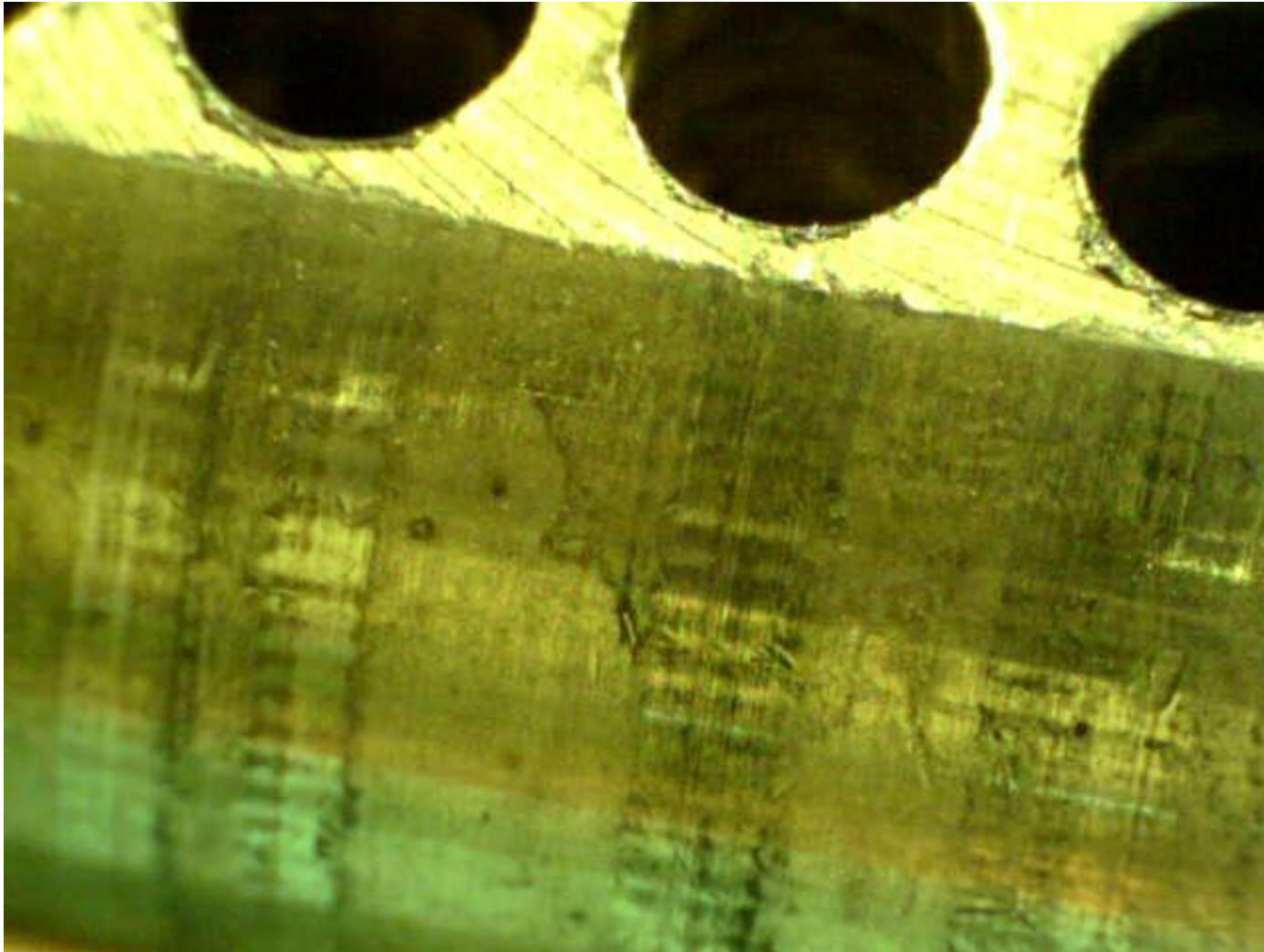
Pins – 1,500 uses (pin 5)



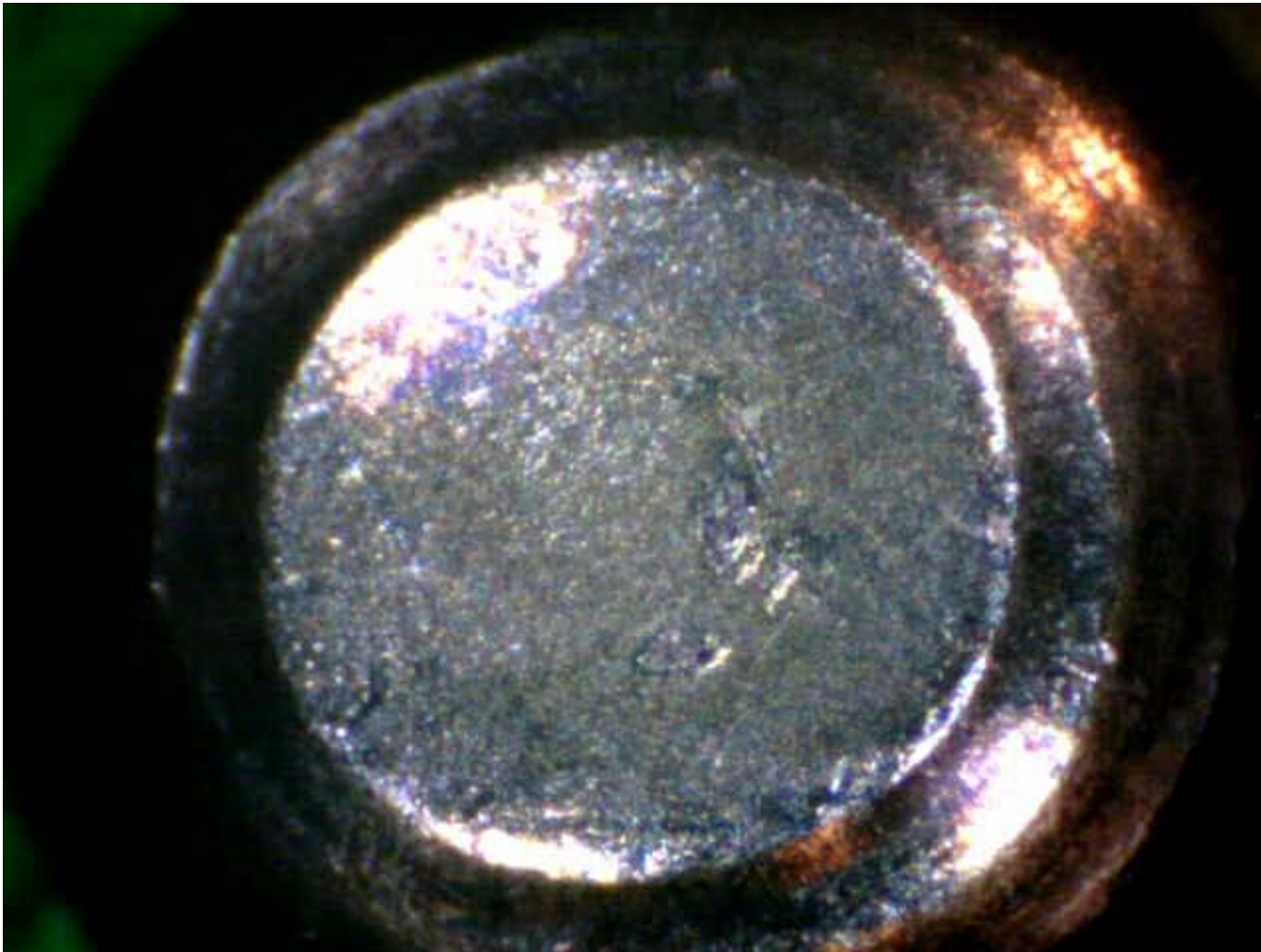
Key – 1,500 uses



Plug – 1,500 uses



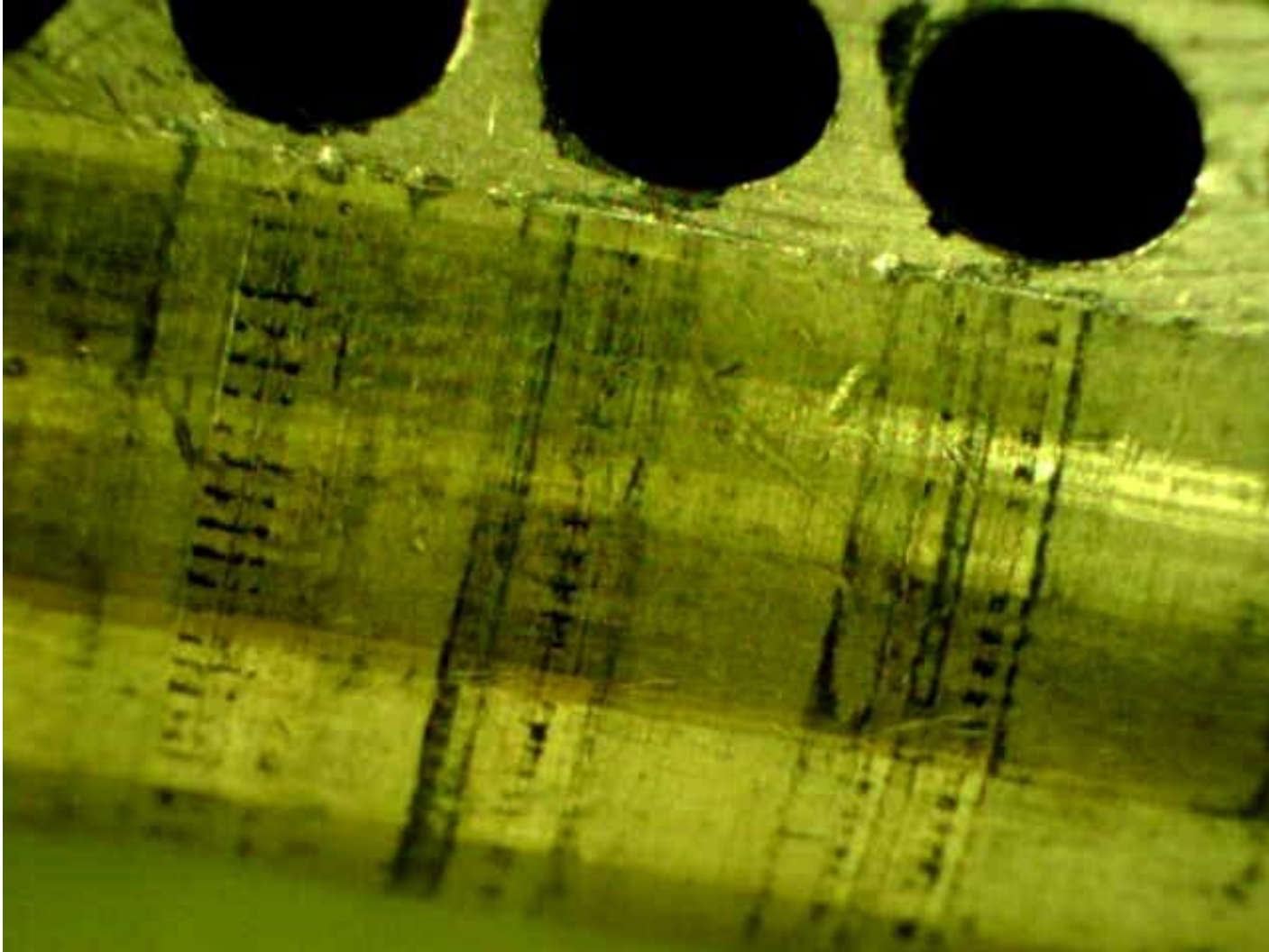
Pins - 5,000 uses (pin 1)



Pins - 5,000 uses (pin 5)



Plug – 5,000 uses



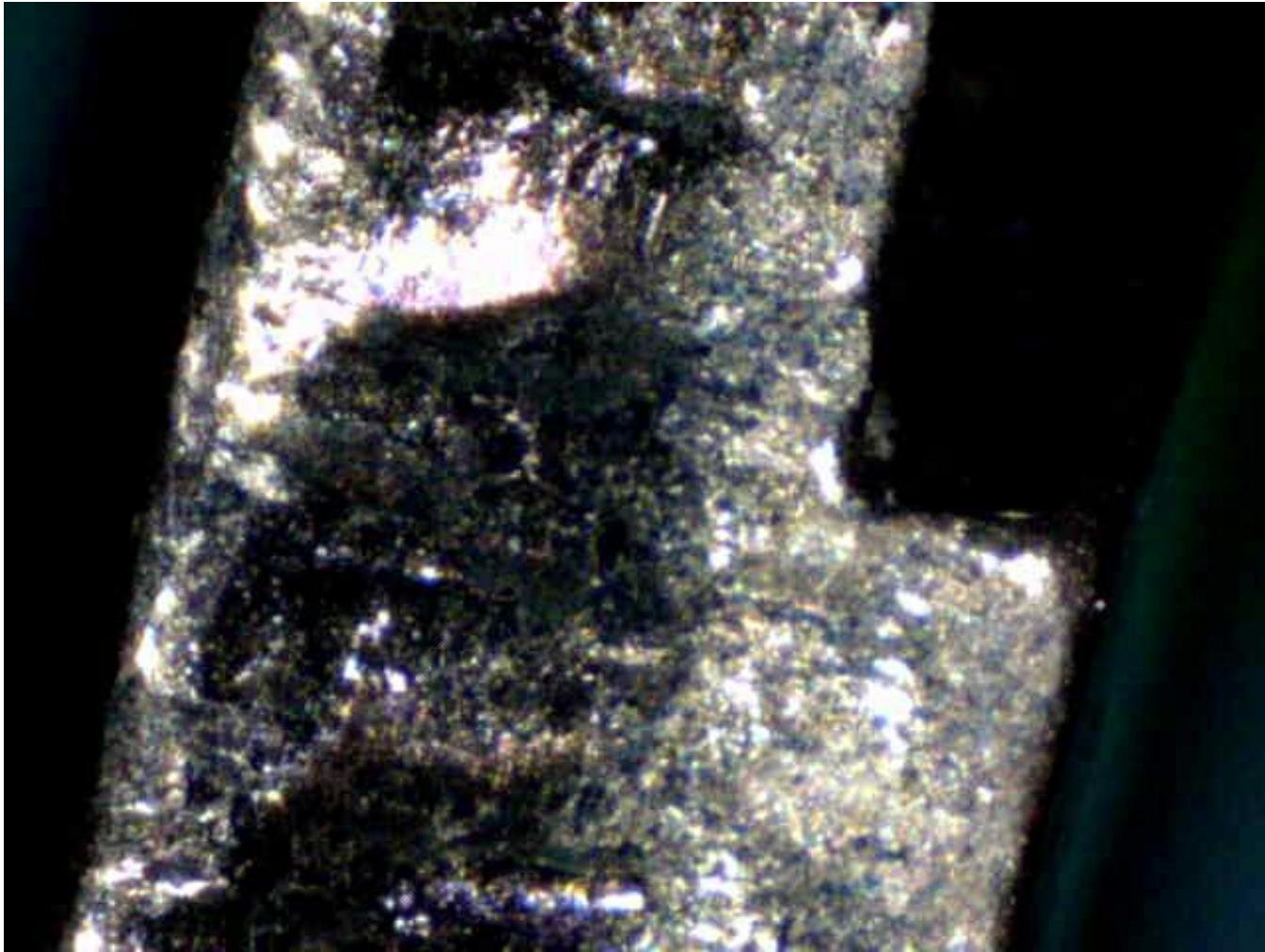
Plug – 5,000 uses



Plug – 5,000 uses



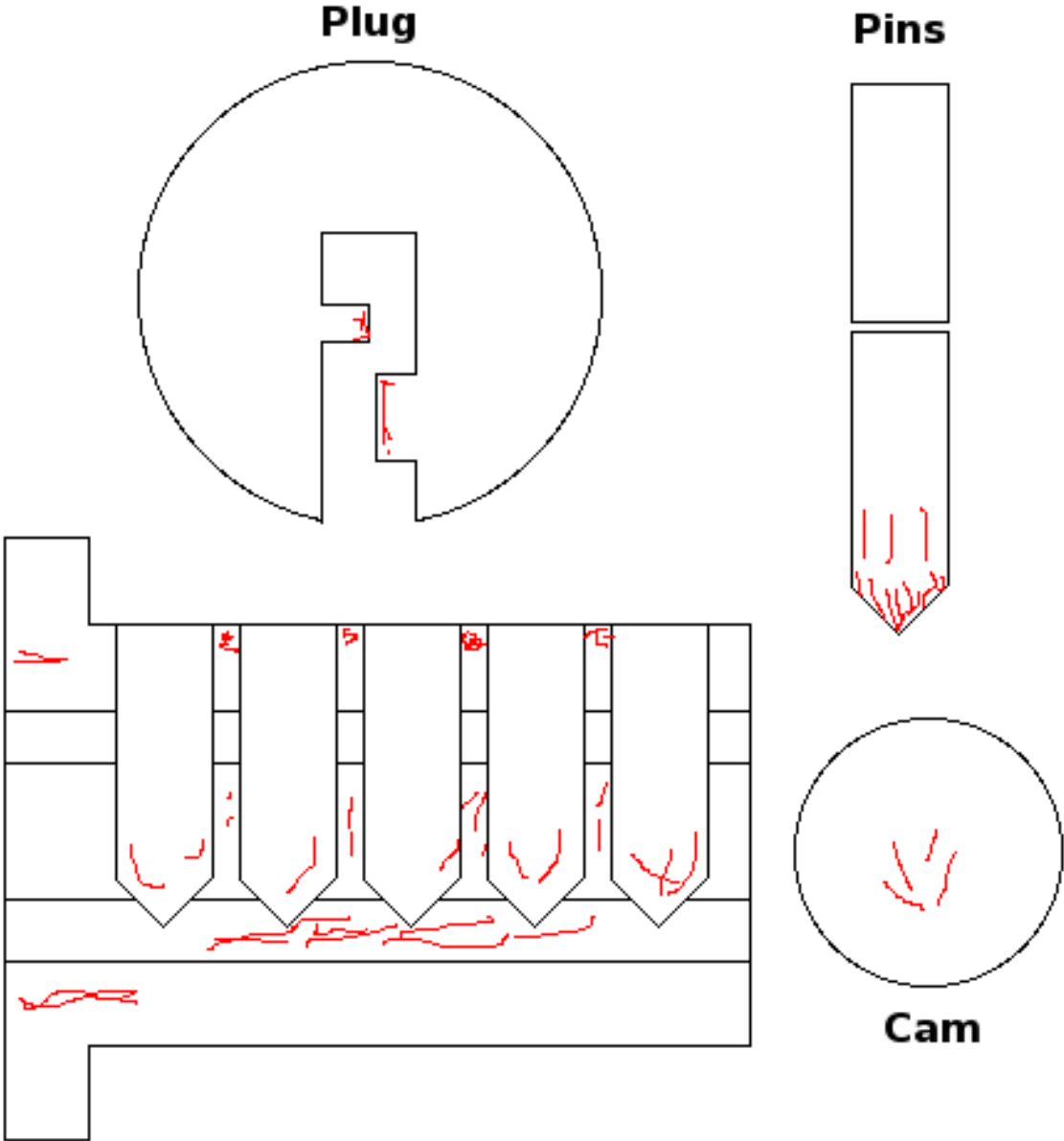
Key - 5,000 uses



Forensic Analysis

- Components (pins, springs, etc)
- Plug
- Cylinder
- Cam/Actuator
- Keys
- Bolt
- Door, window, wall, etc

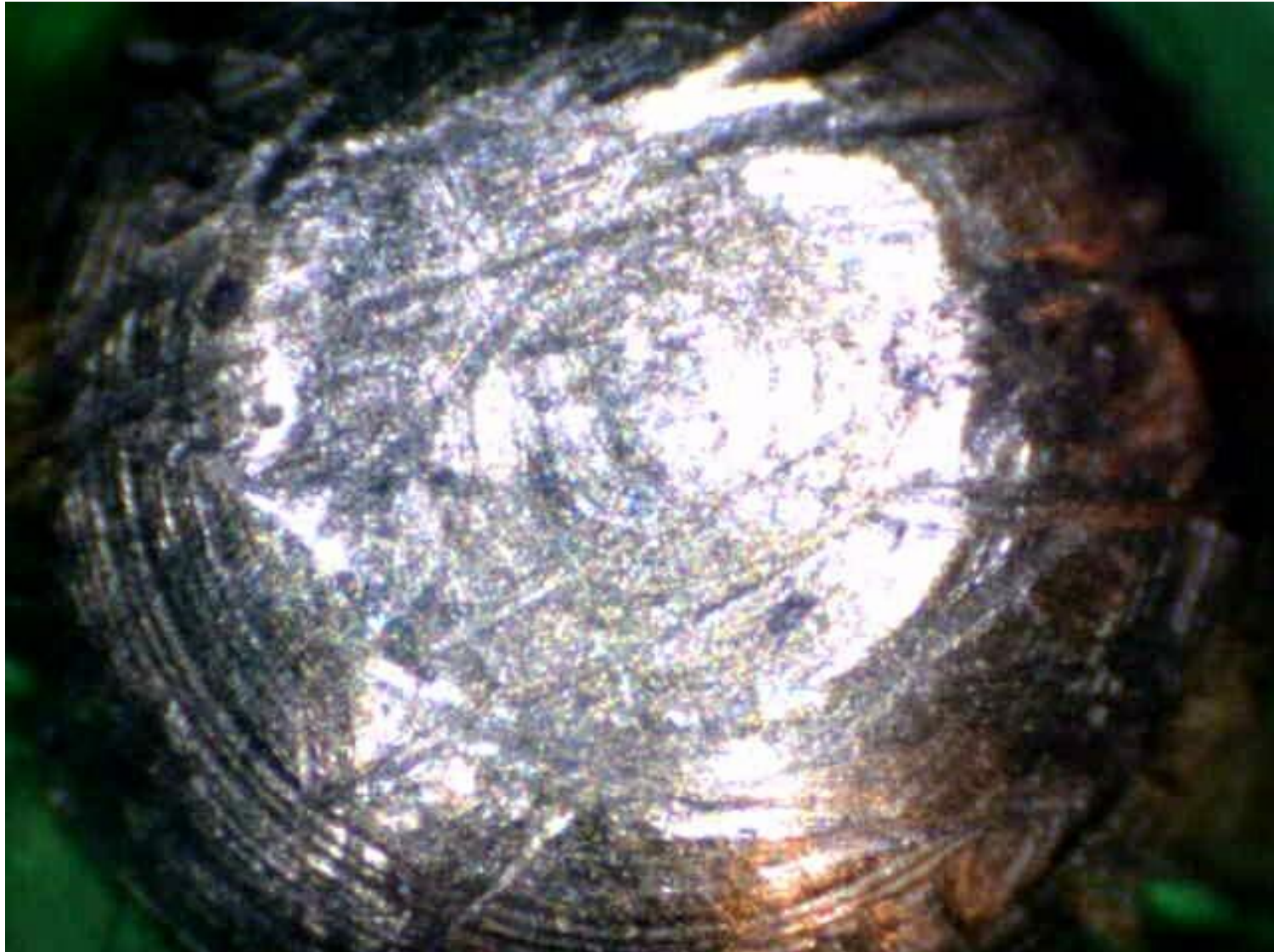
Lockpicking



Lockpicking - Pins



Lockpicking - Pins



Lockpicking - Pins



Lockpicking - Pins



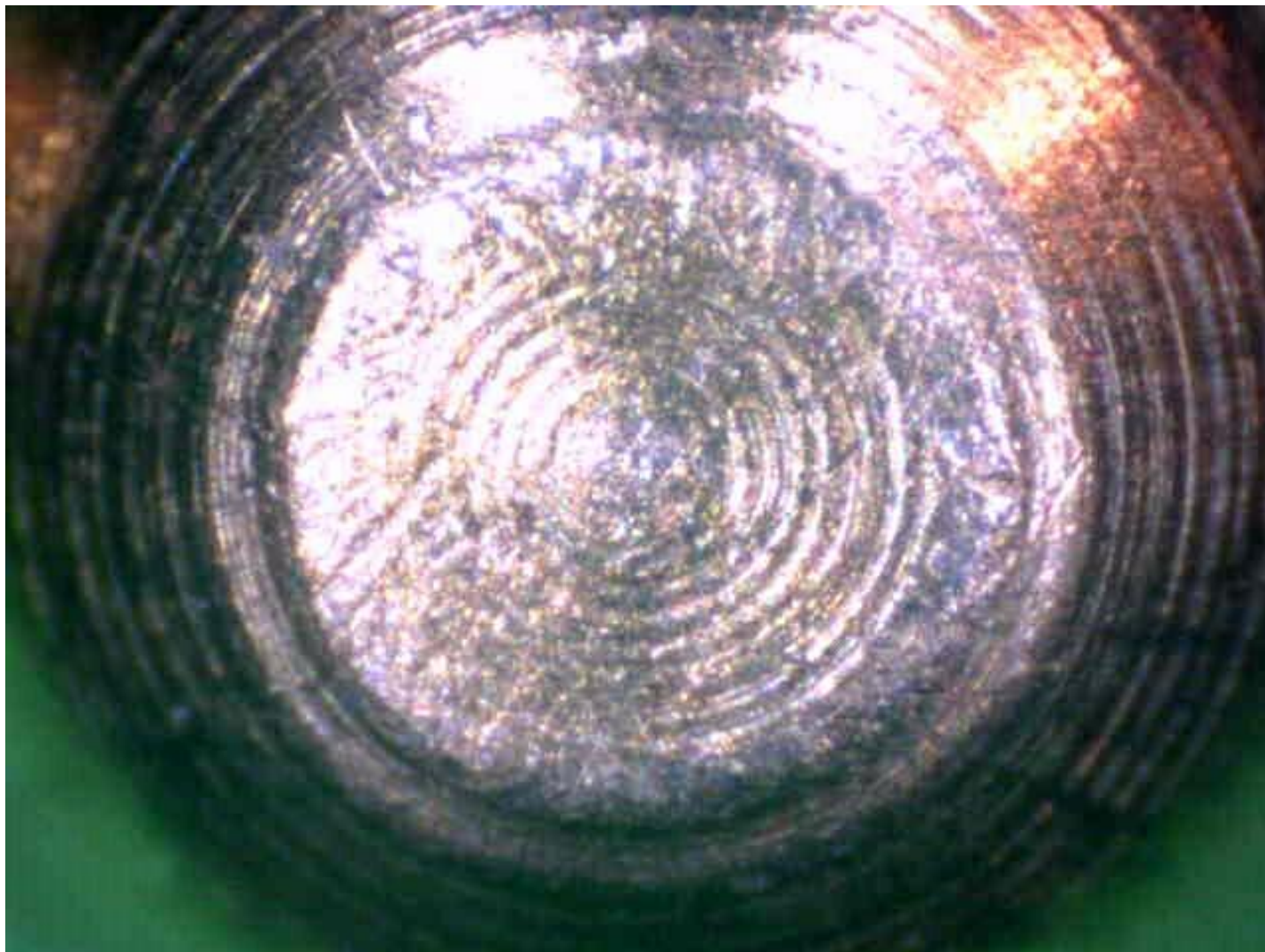
Lockpicking - Pins



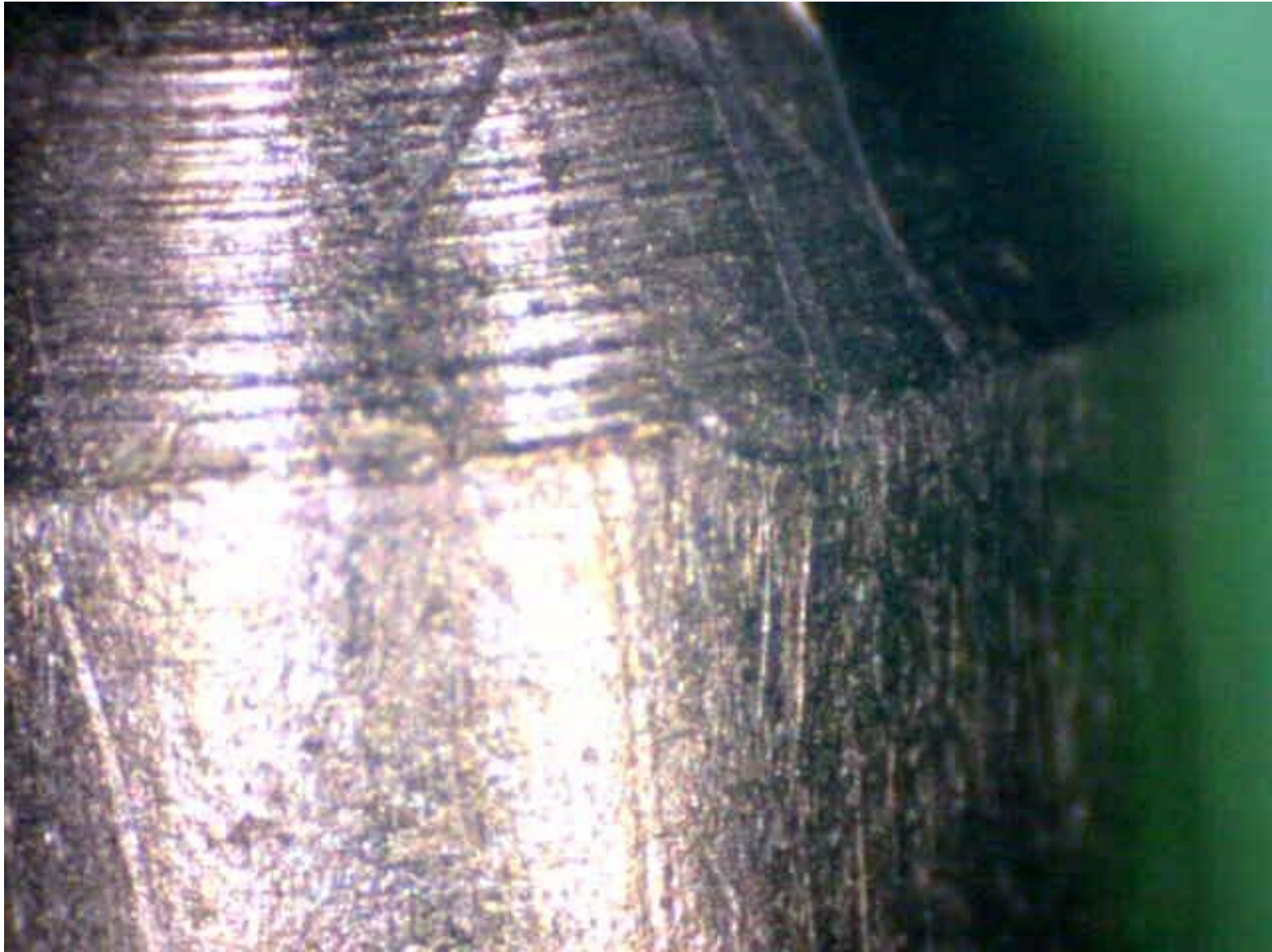
Lockpicking - Pins



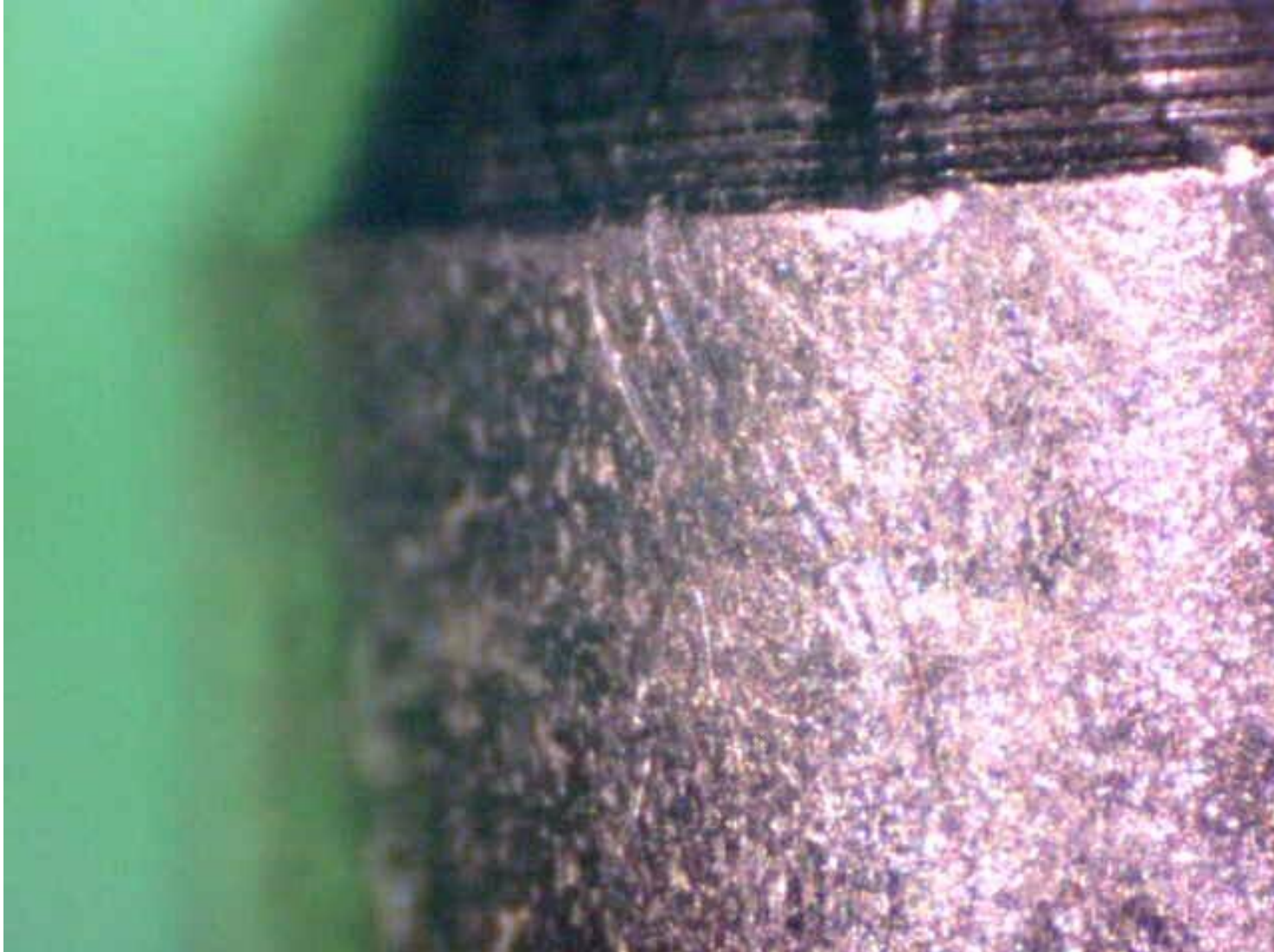
Lockpicking - Pins



Lockpicking - Pins



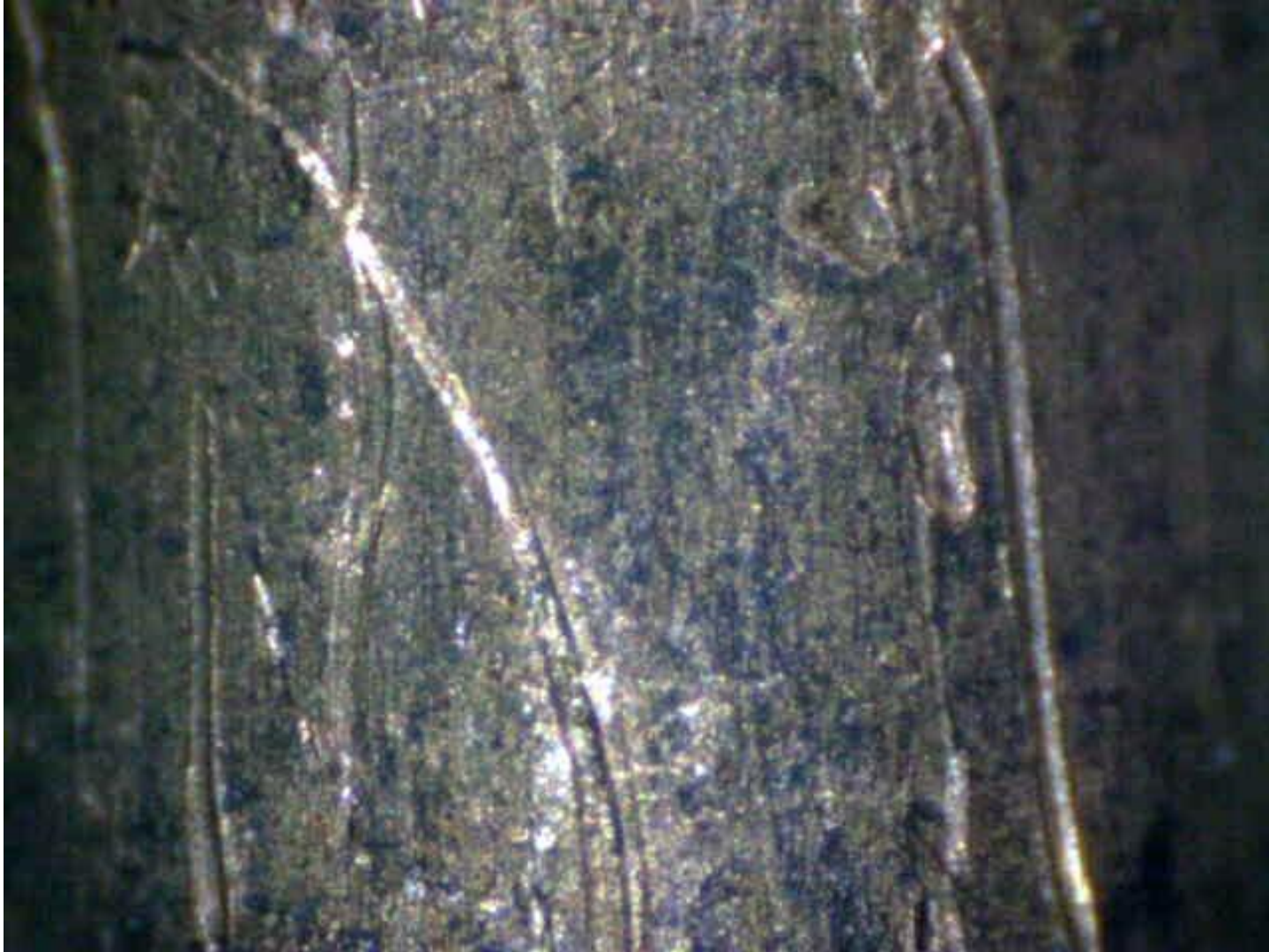
Lockpicking - Pins



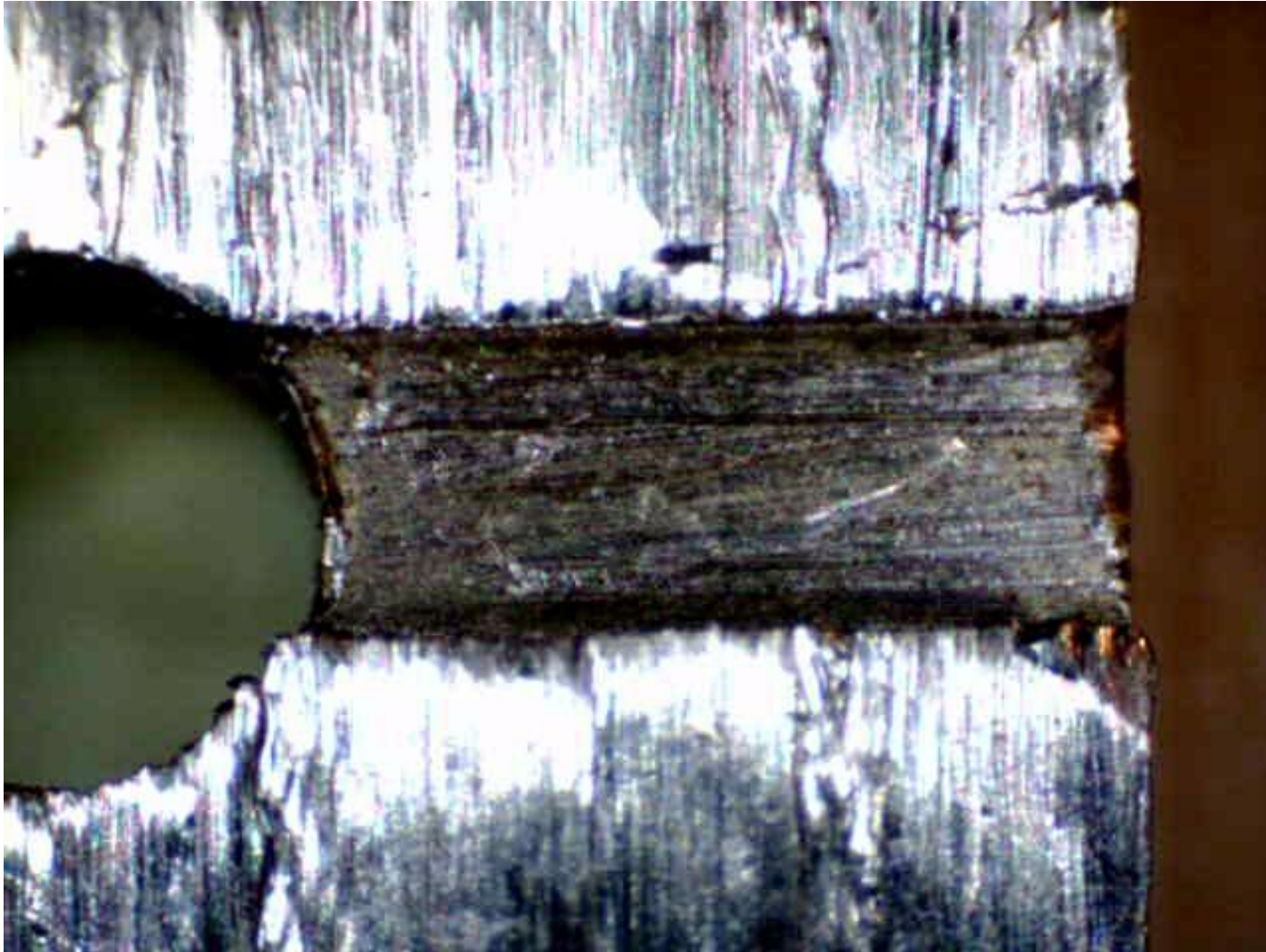
Lockpicking - Pins



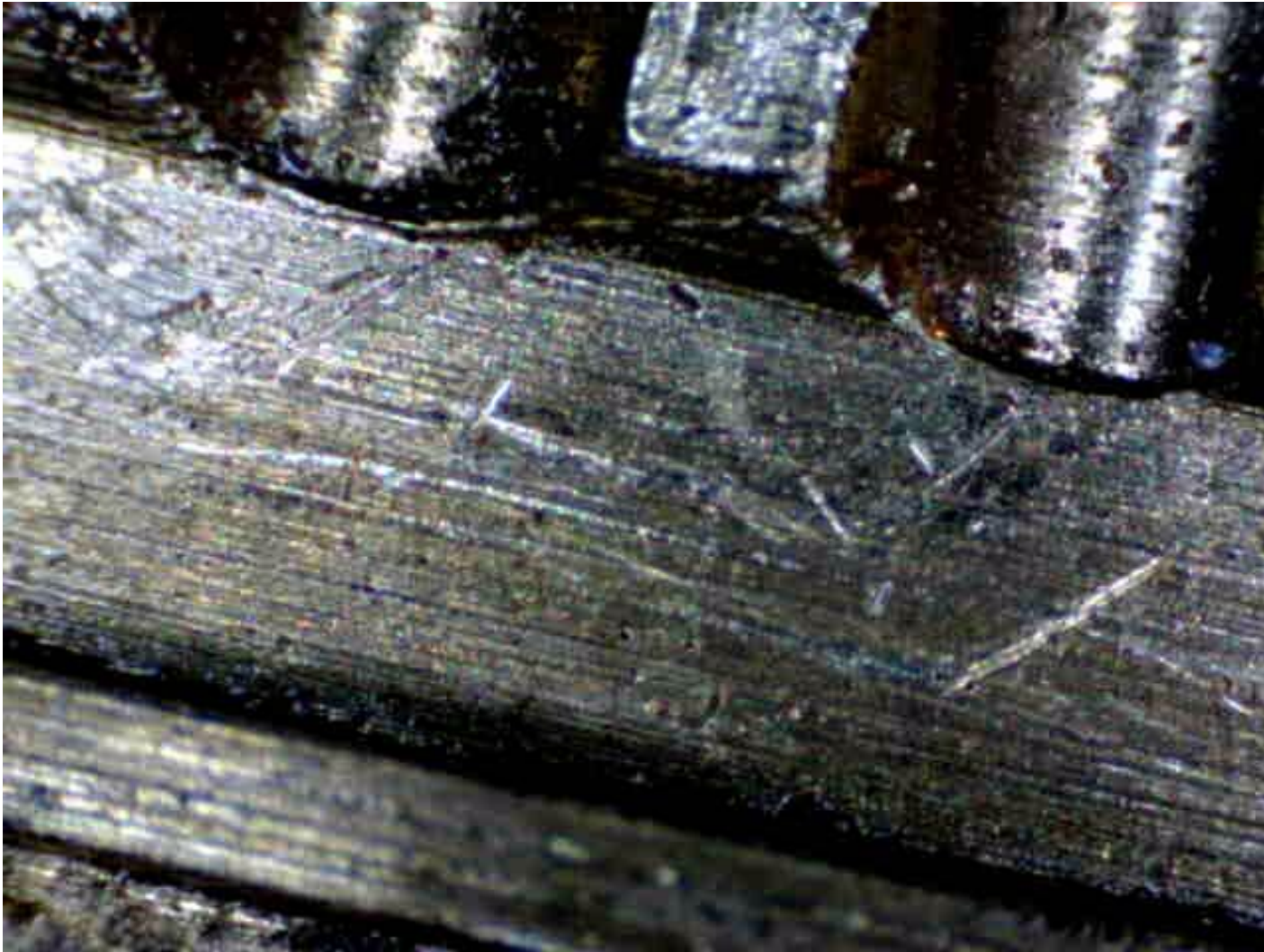
Lockpicking - Pins



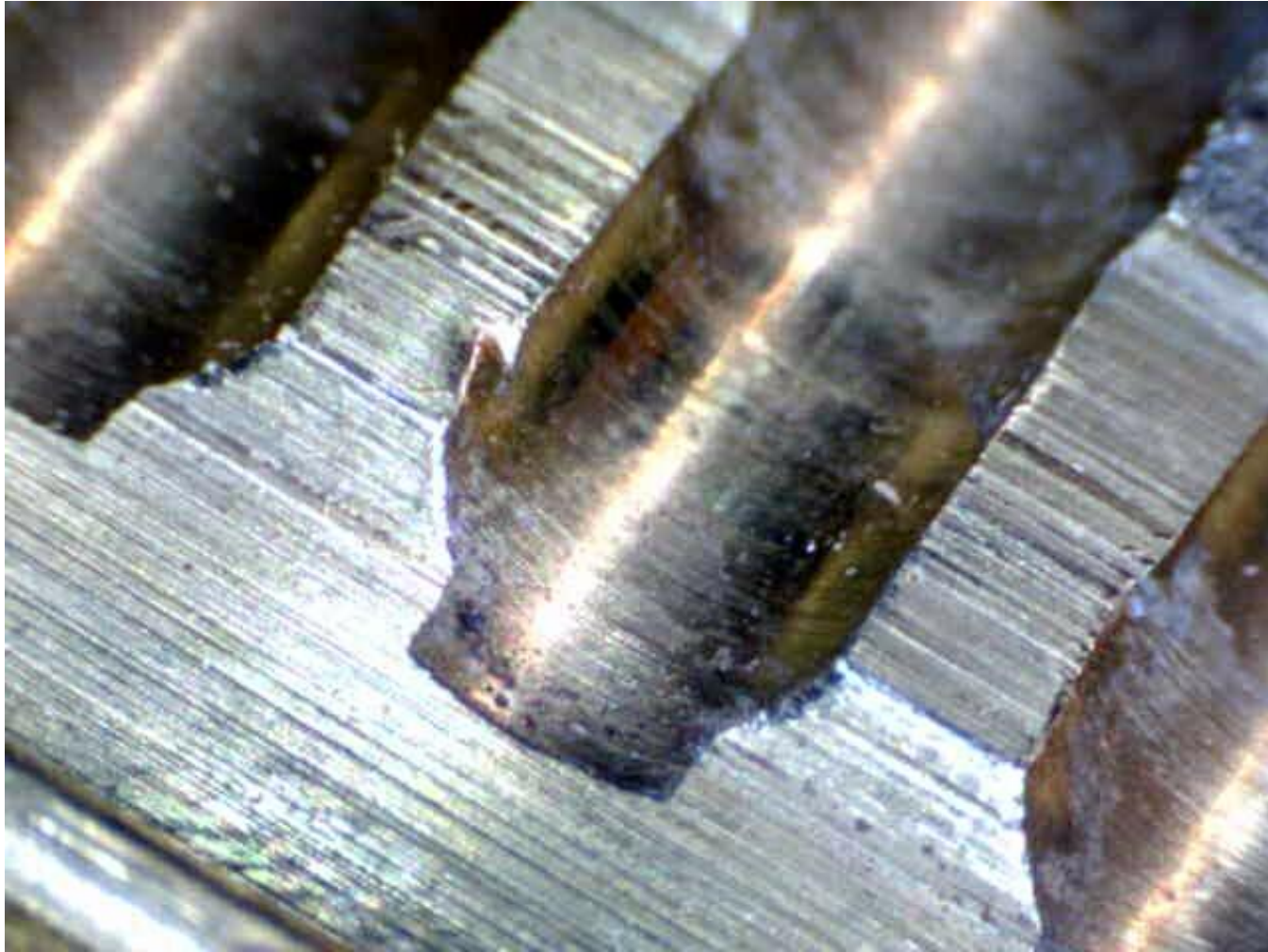
Lockpicking - Plug



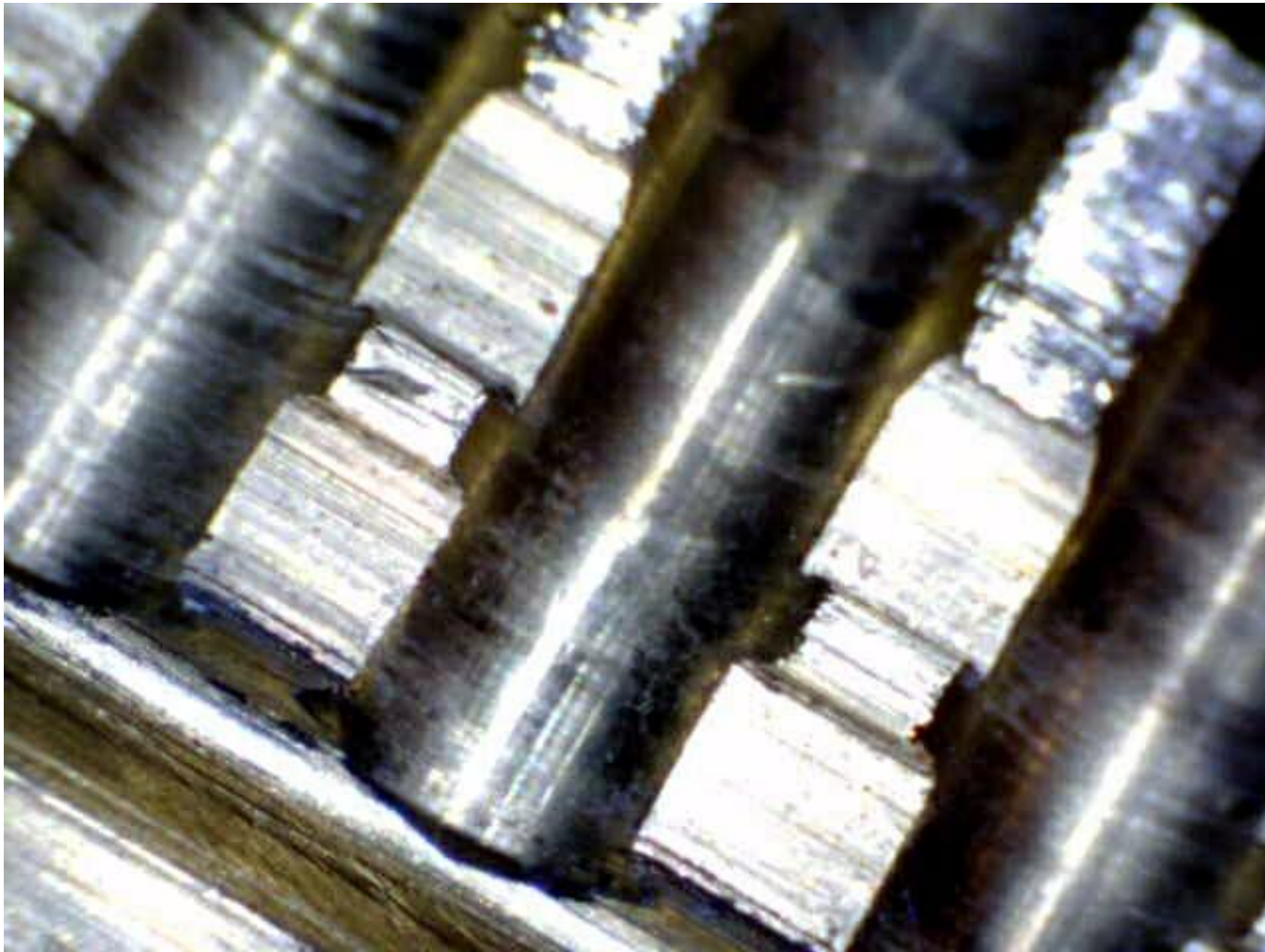
Lockpicking - Plug



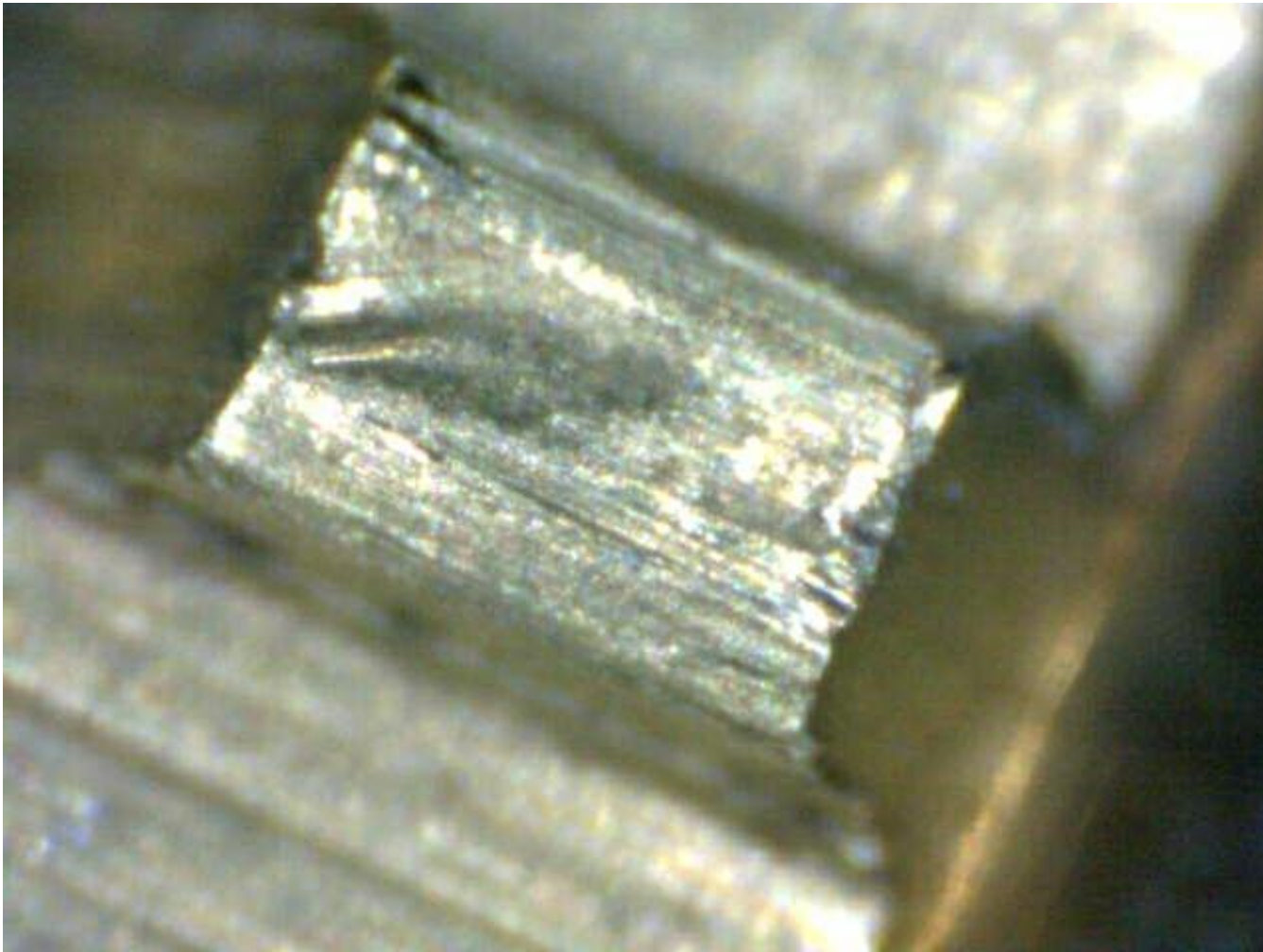
Lockpicking - Plug



Lockpicking - Plug



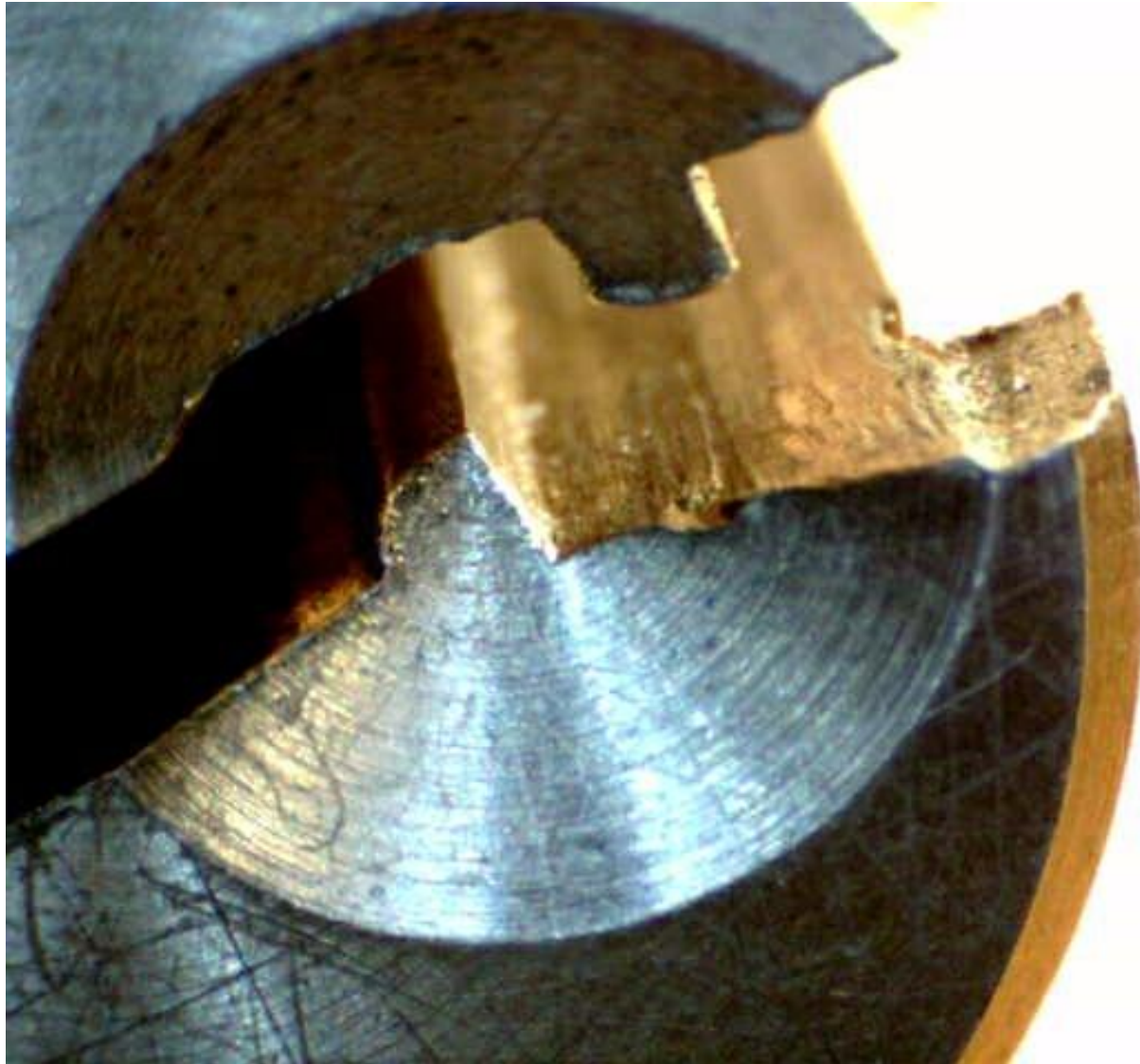
Lockpicking - Plug



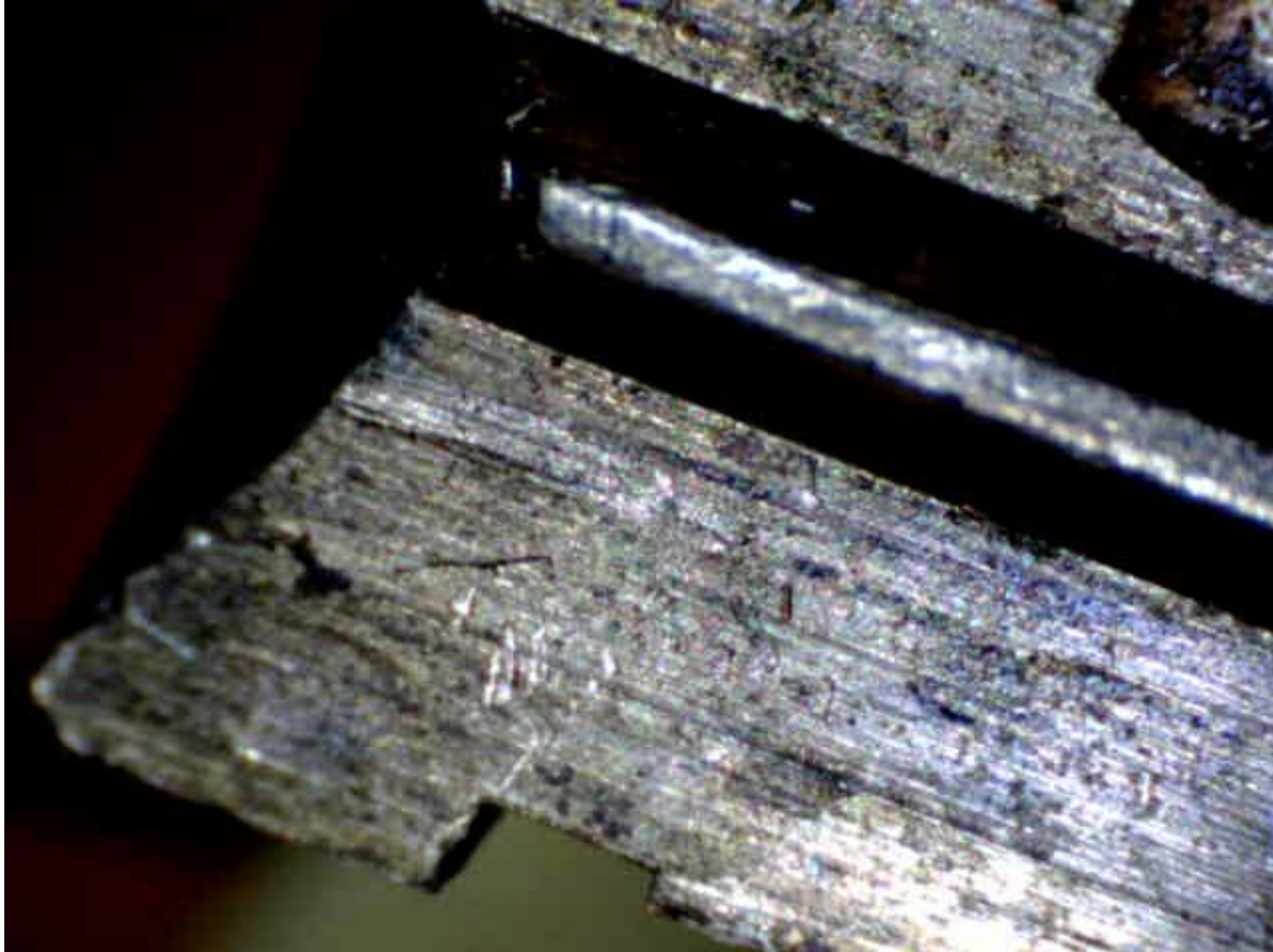
Lockpicking - Plug



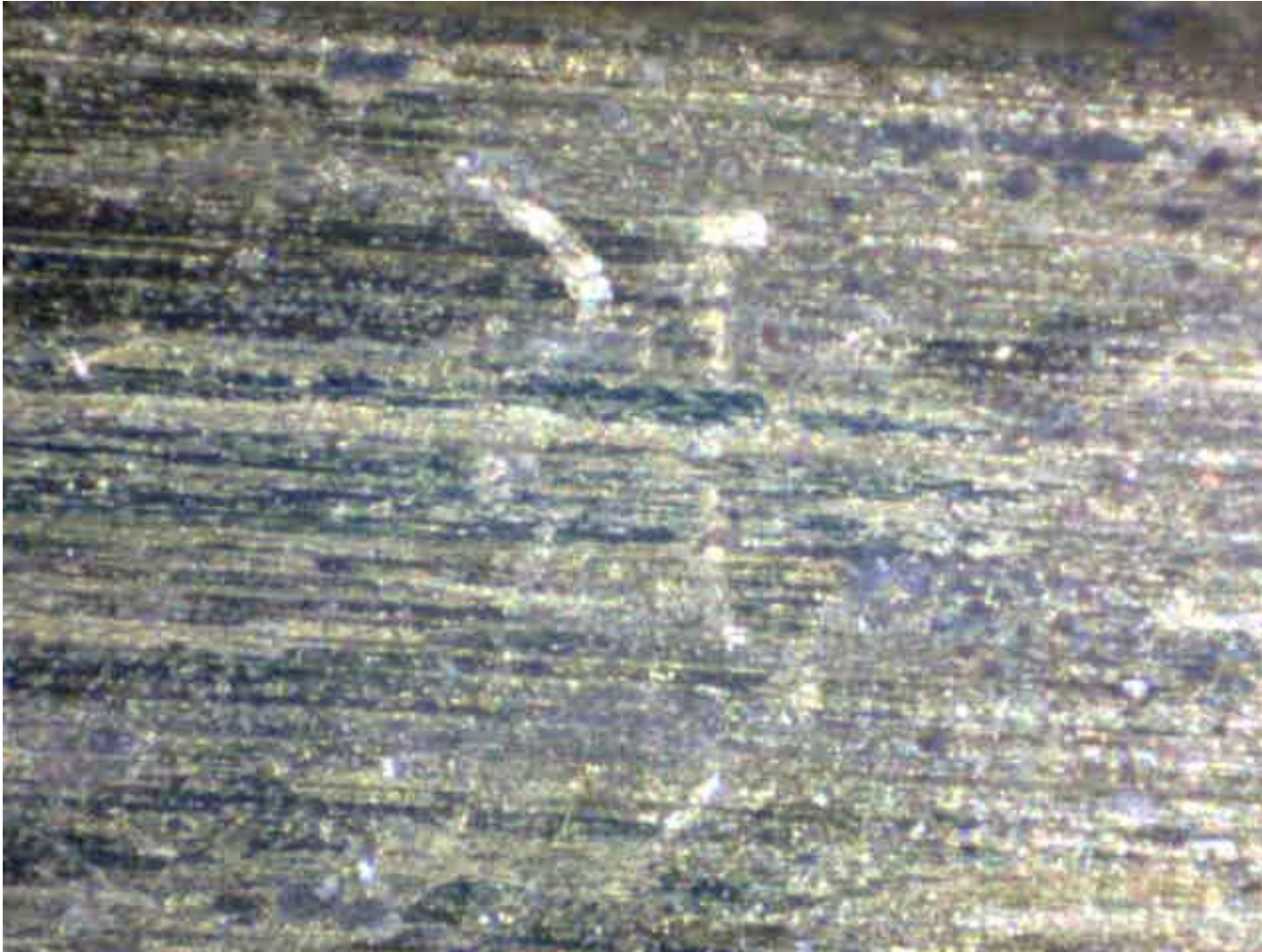
Lockpicking - Tension



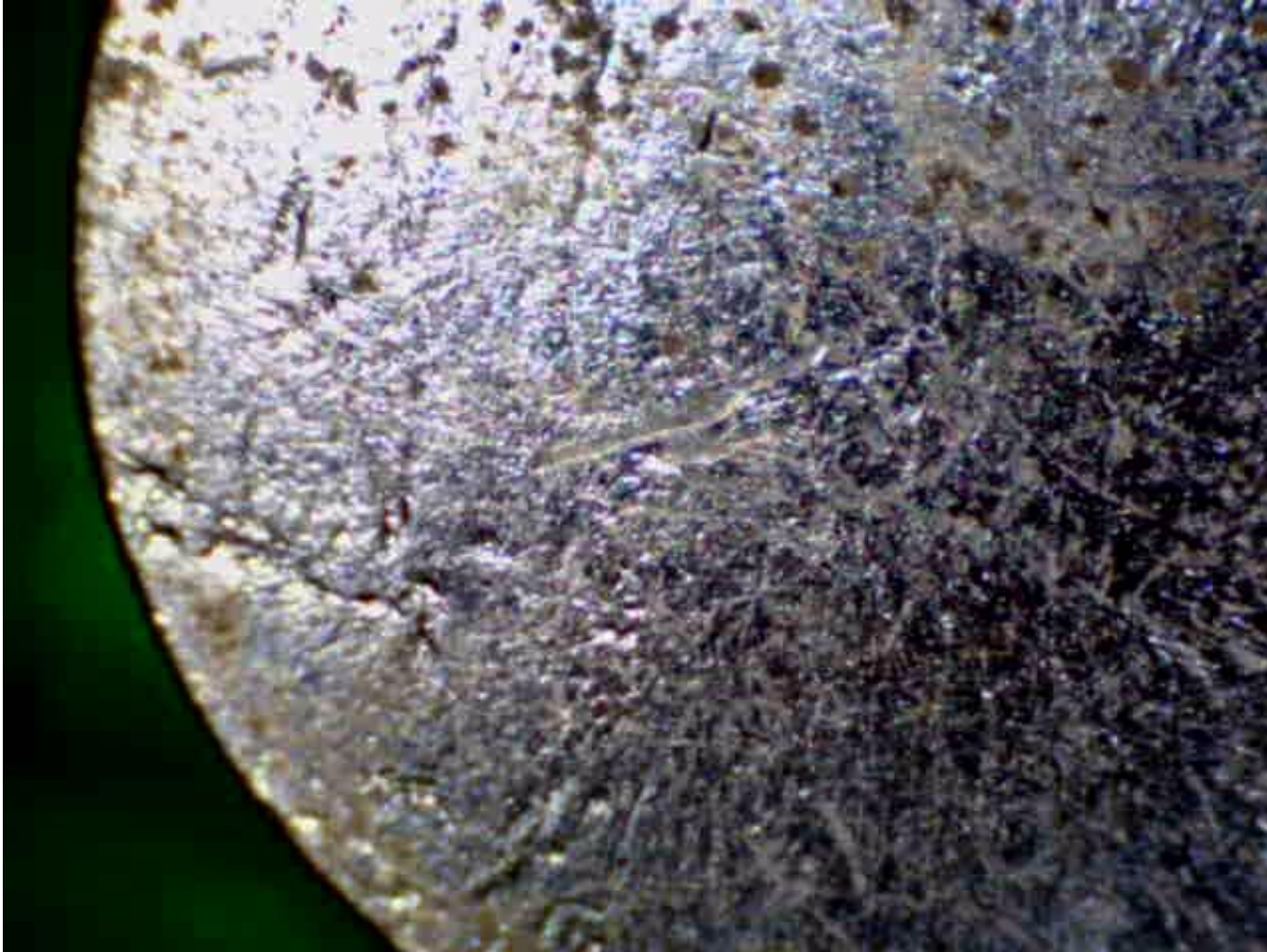
Lockpicking - Tension



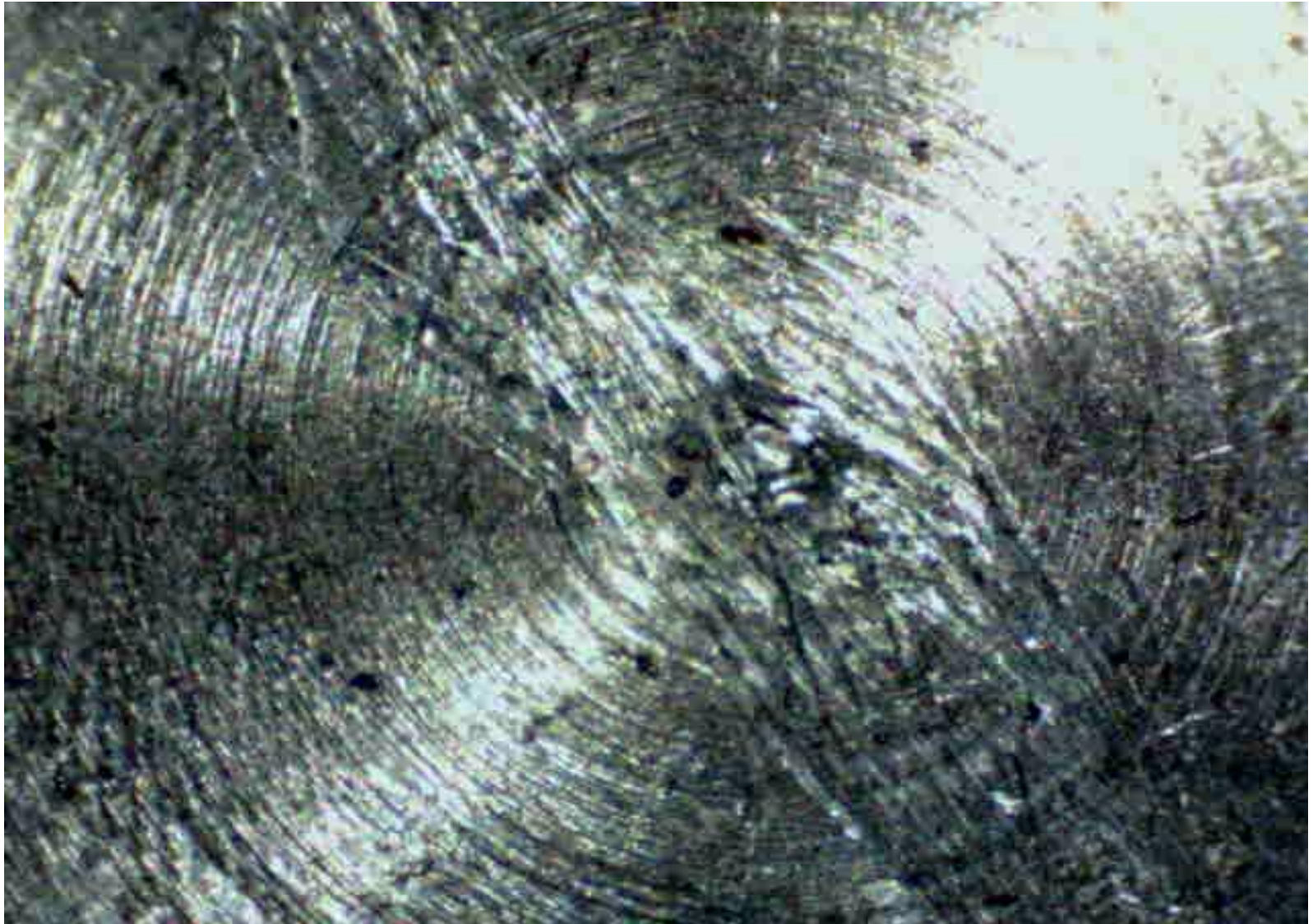
Lockpicking - Tension



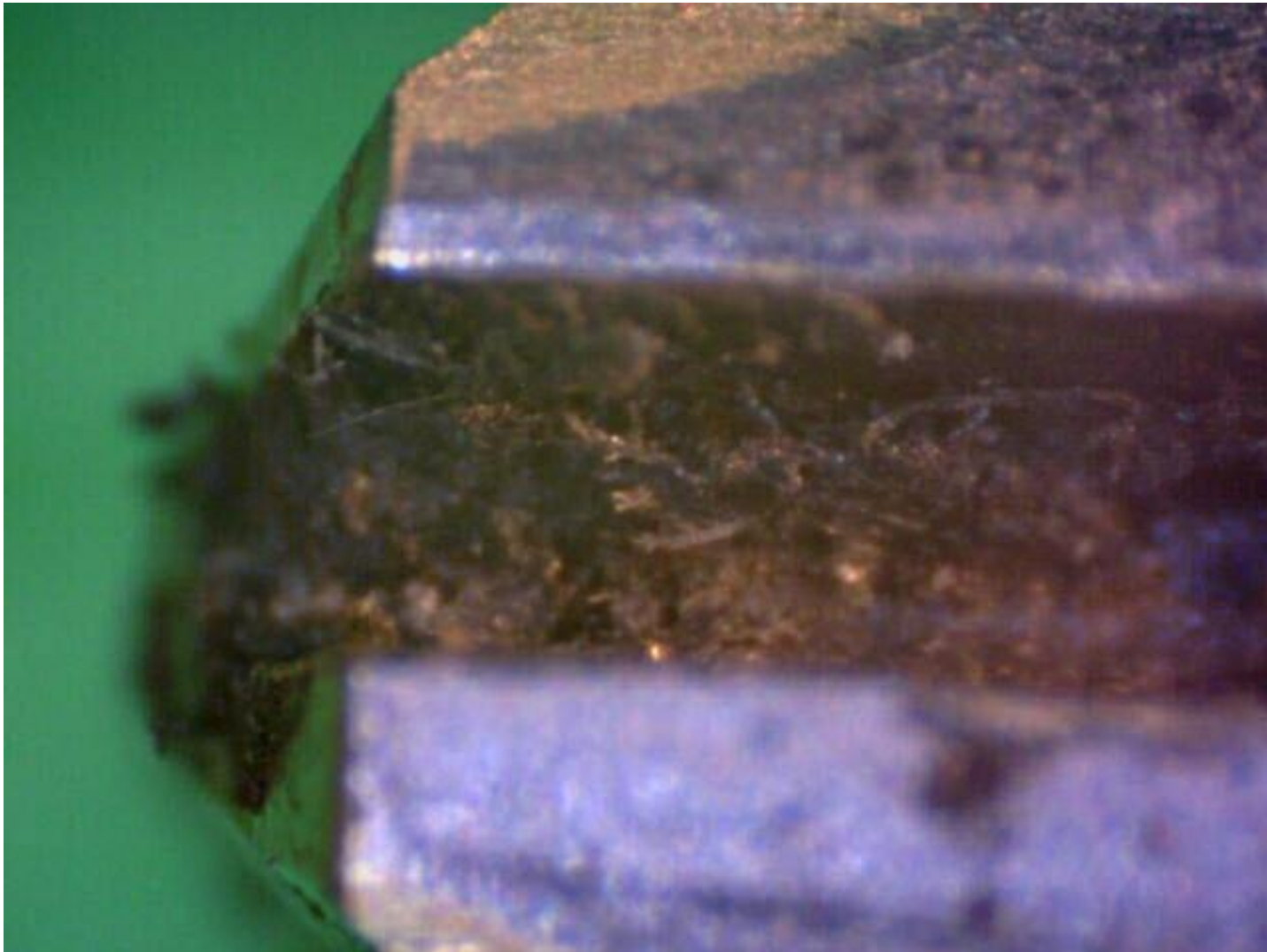
Lockpicking - Cam



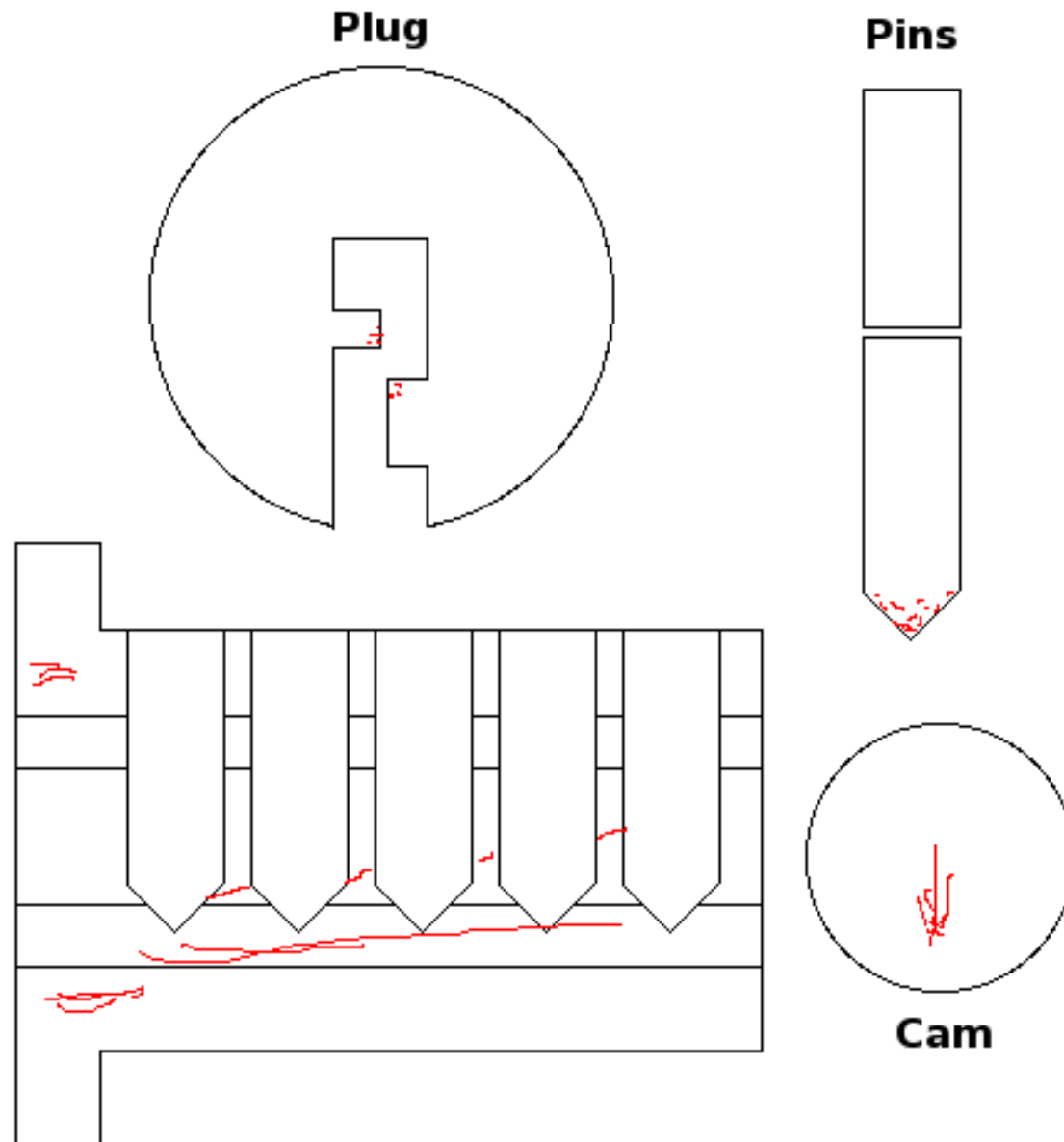
Lockpicking - Cam



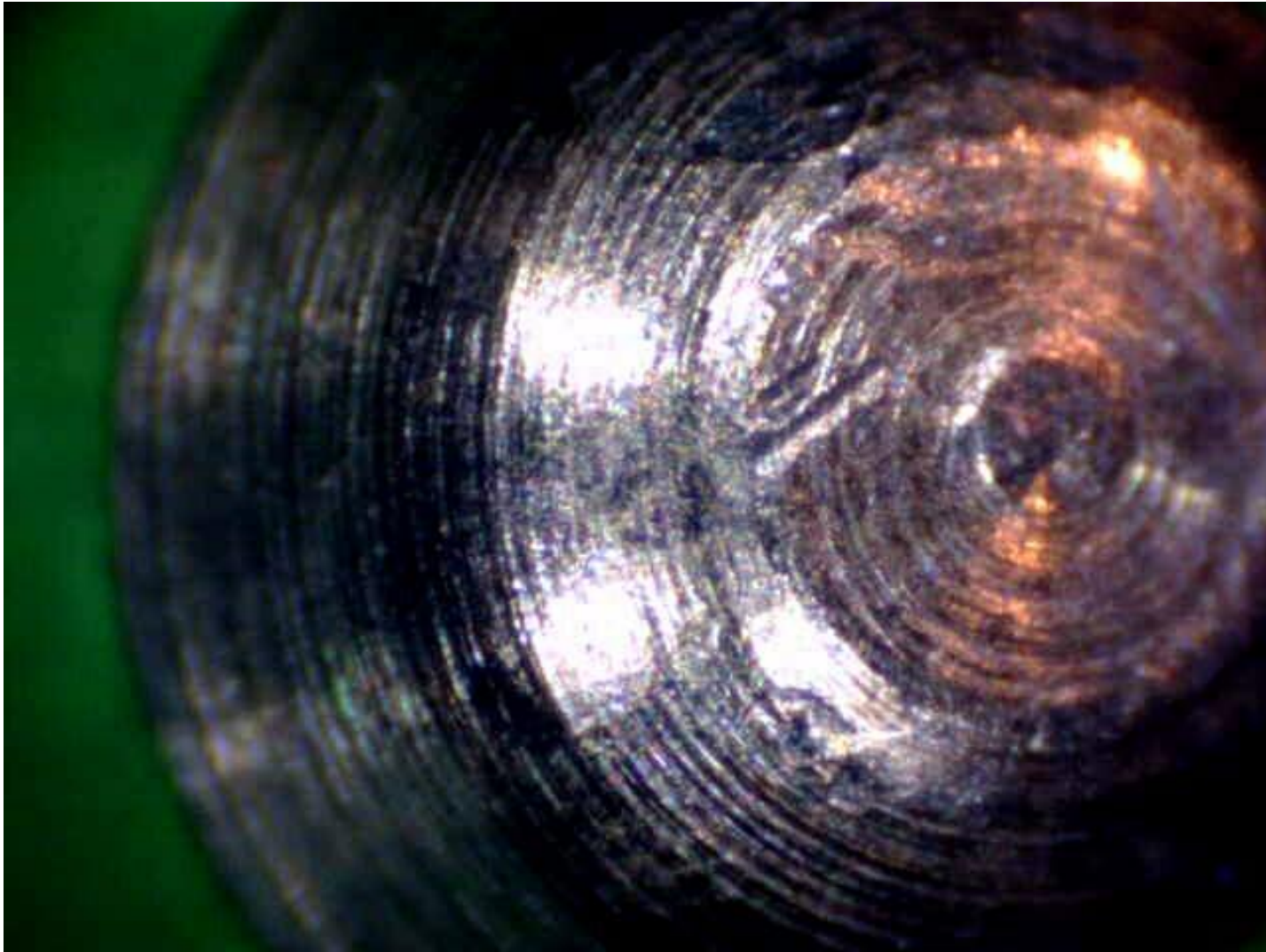
Lockpicking - Medecoder



Pick Guns



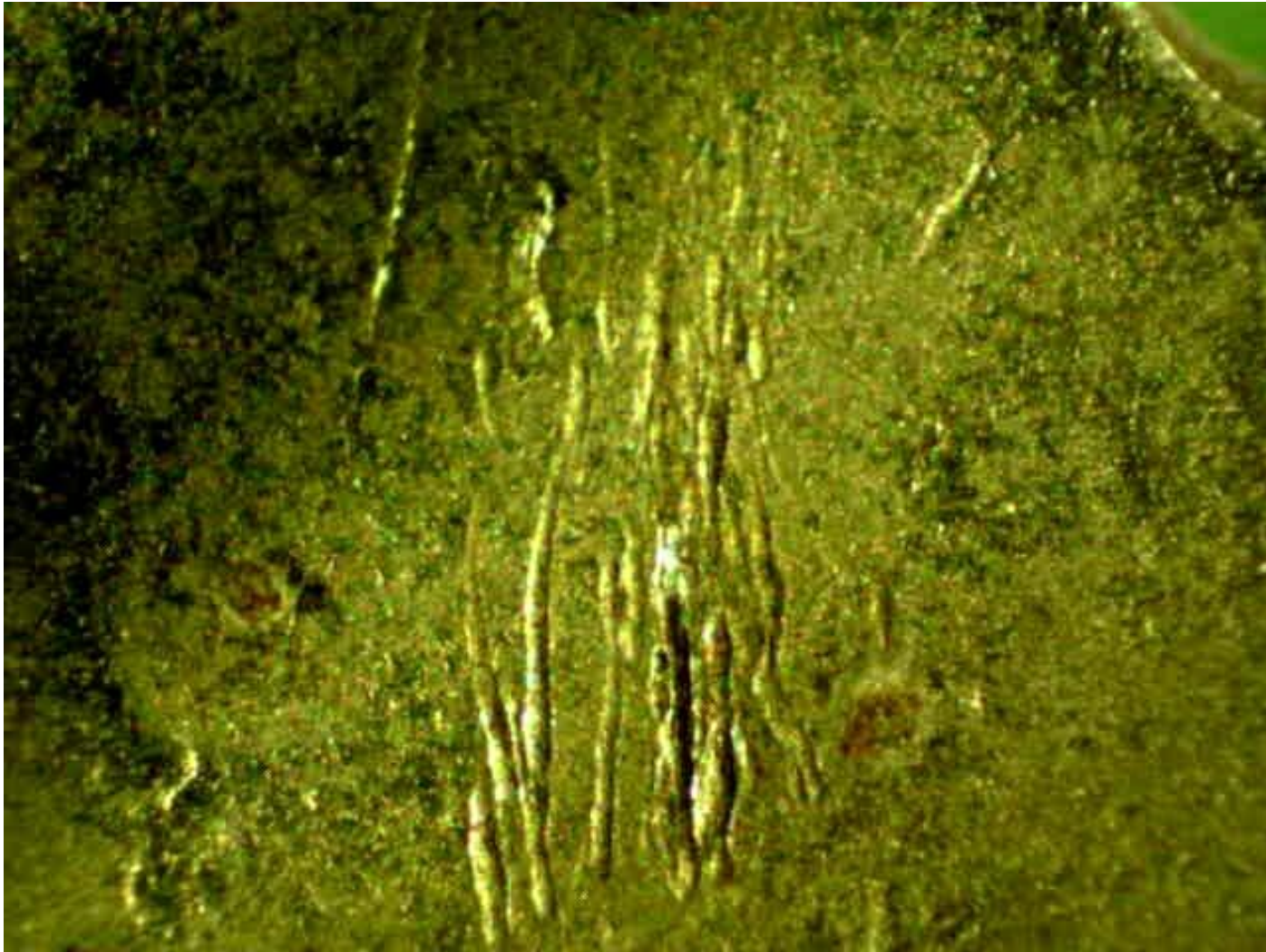
Pick Guns - Pins



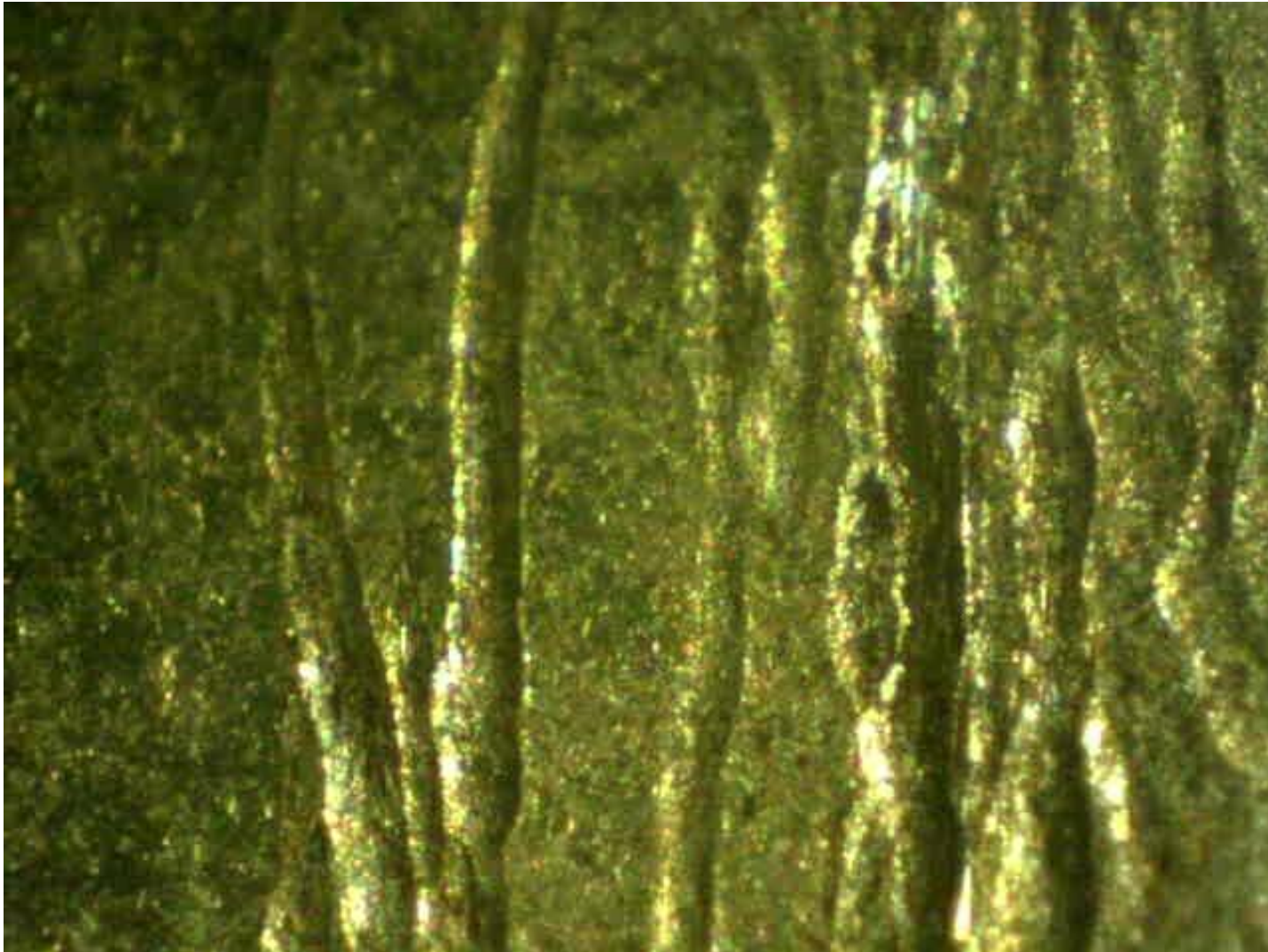
Pick Guns - Pins



Pick Guns - Cam



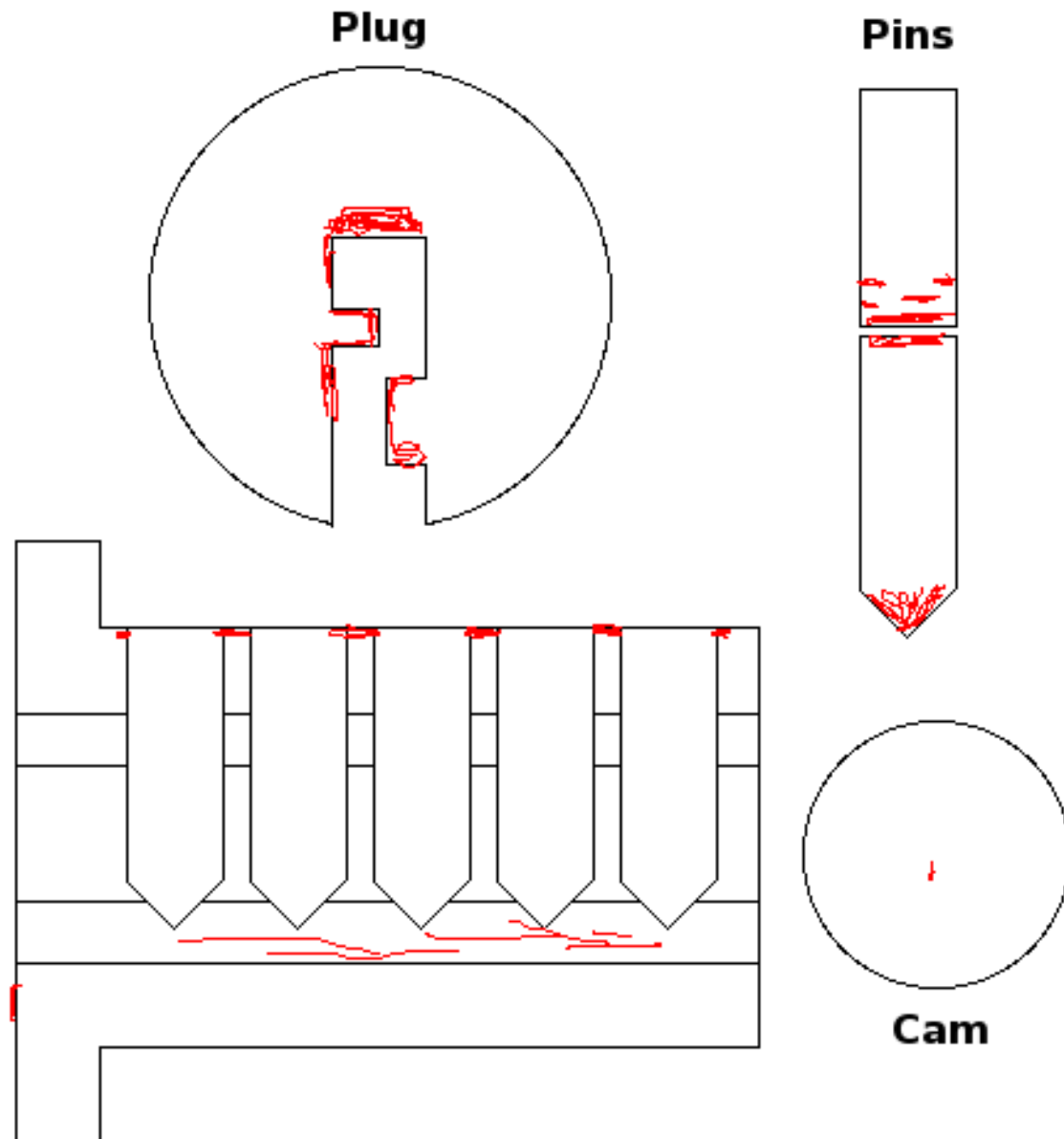
Pick Guns - Cam



Key Bumping



Key Bumping



Key Bumping - Pins



Key Bumping - Pins



Key Bumping - Pins



Key Bumping - Pins



Key Bumping - Pins



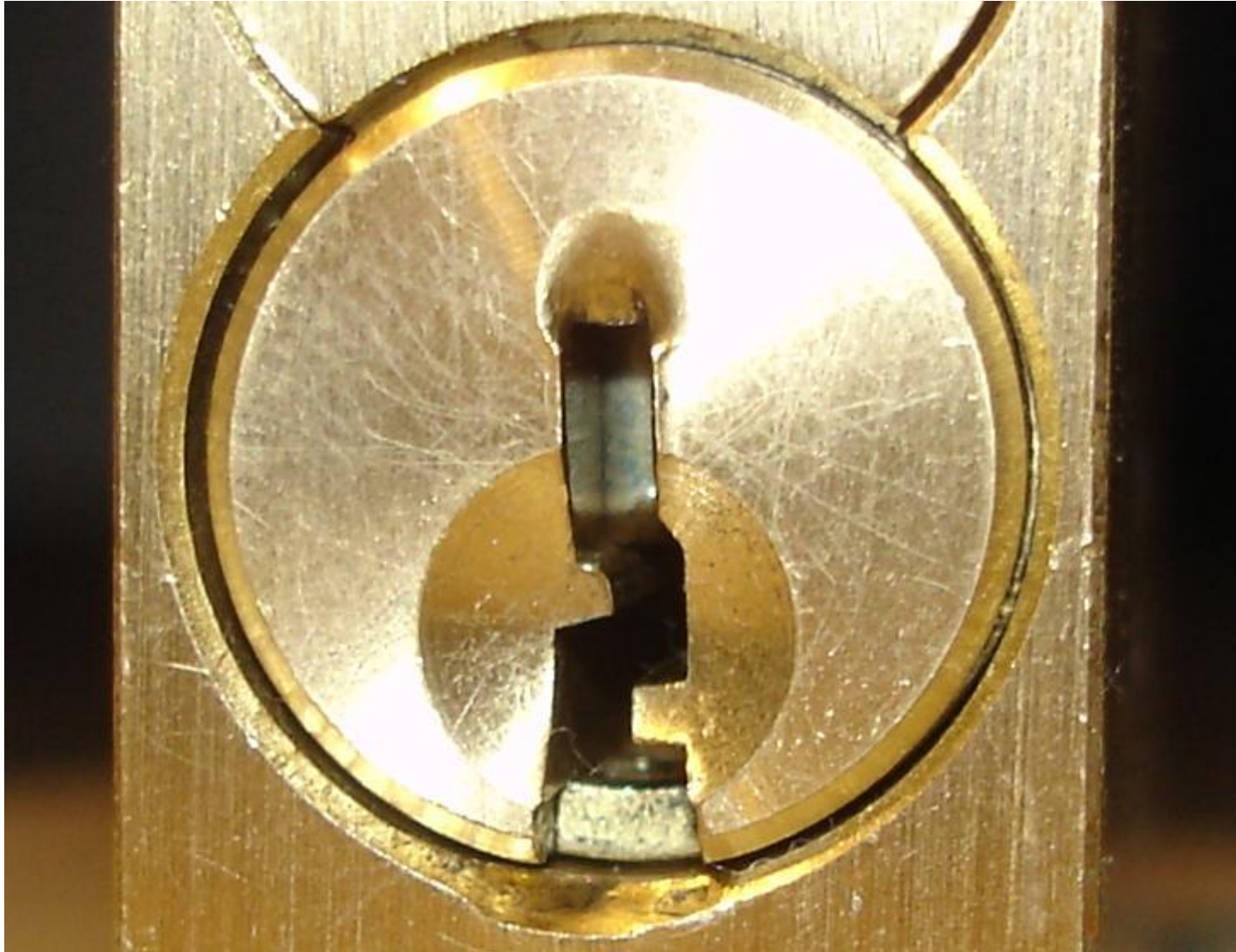
Key Bumping - Pins



Key Bumping - Plug



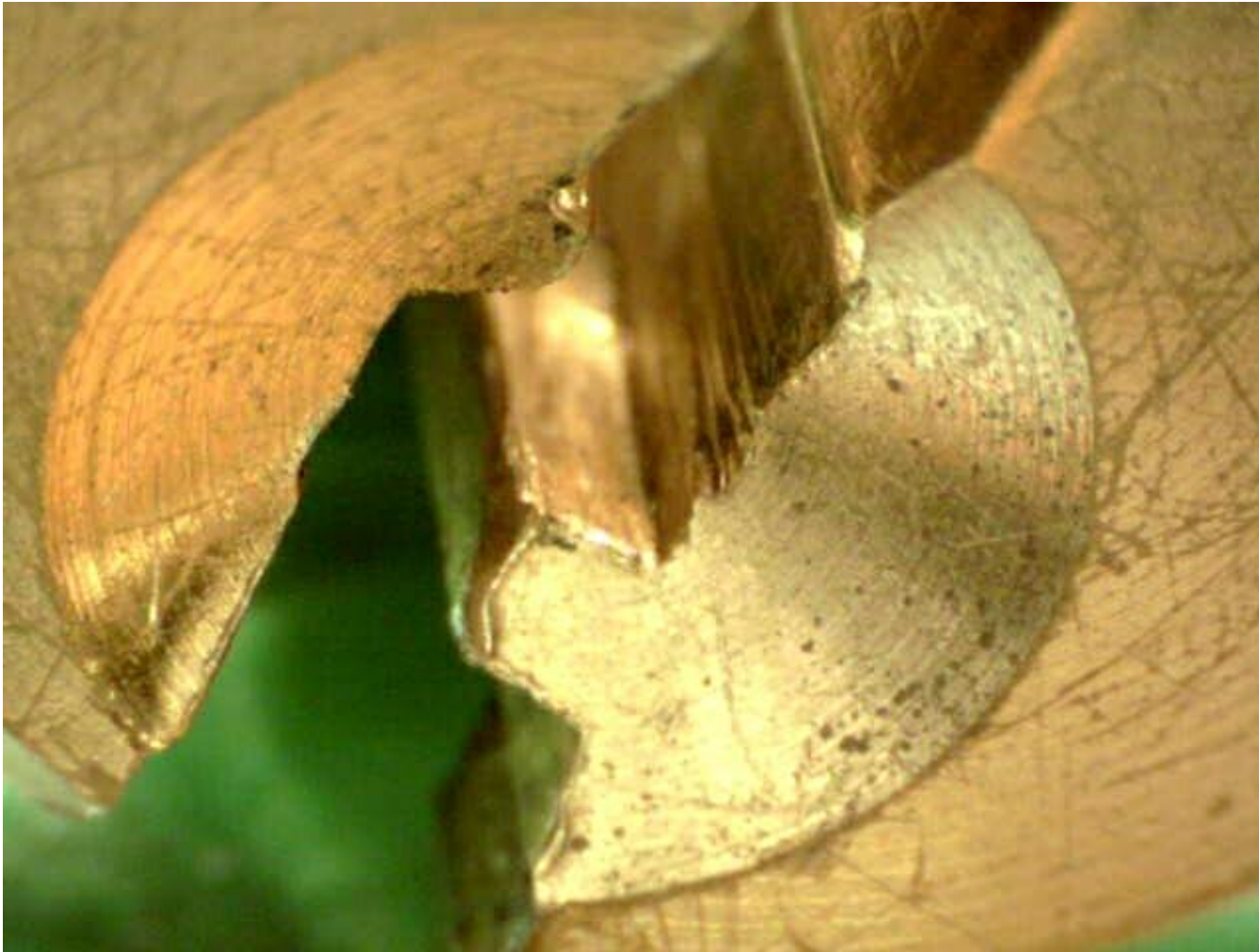
Key Bumping - Face



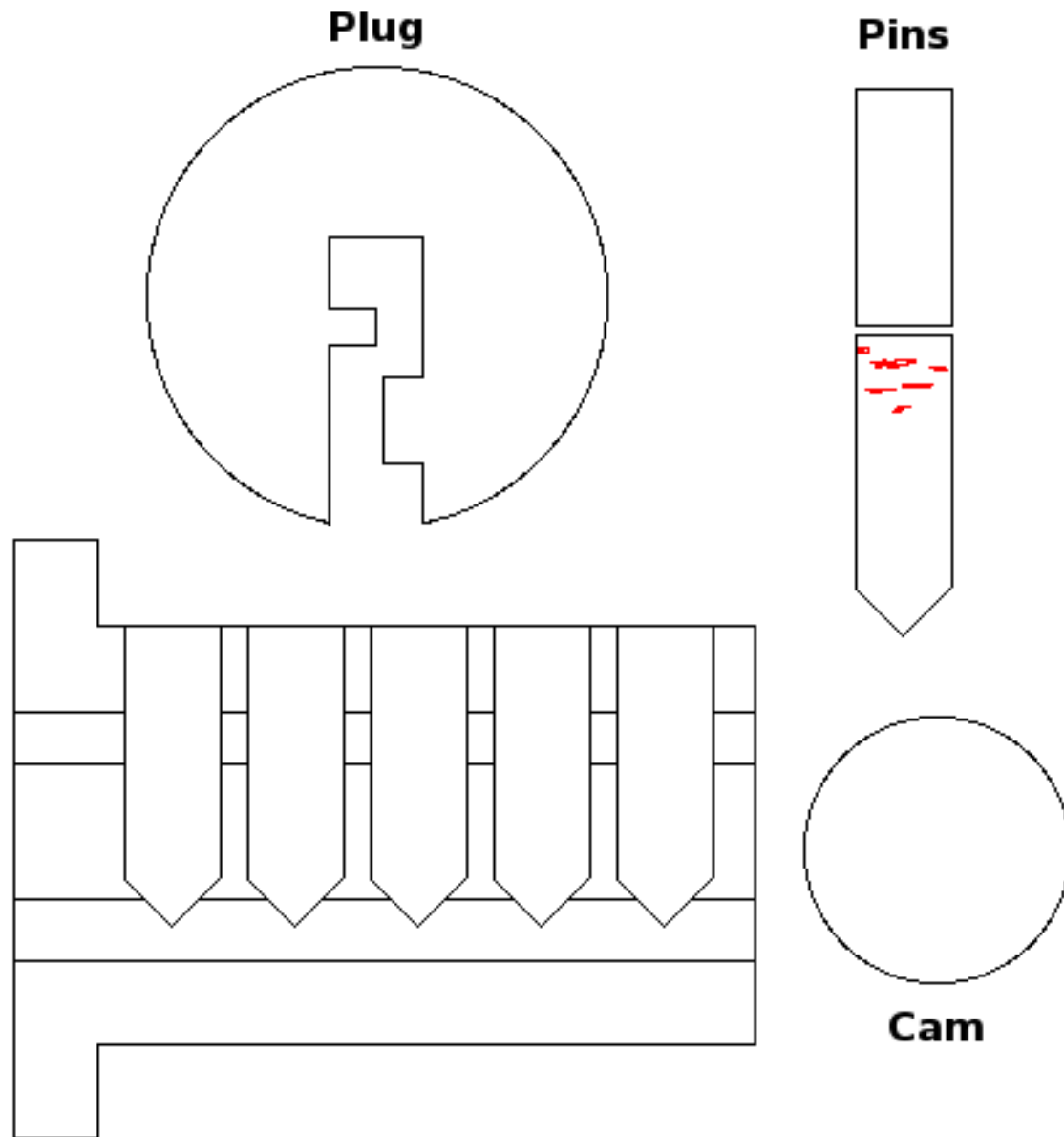
Key Bumping - Face



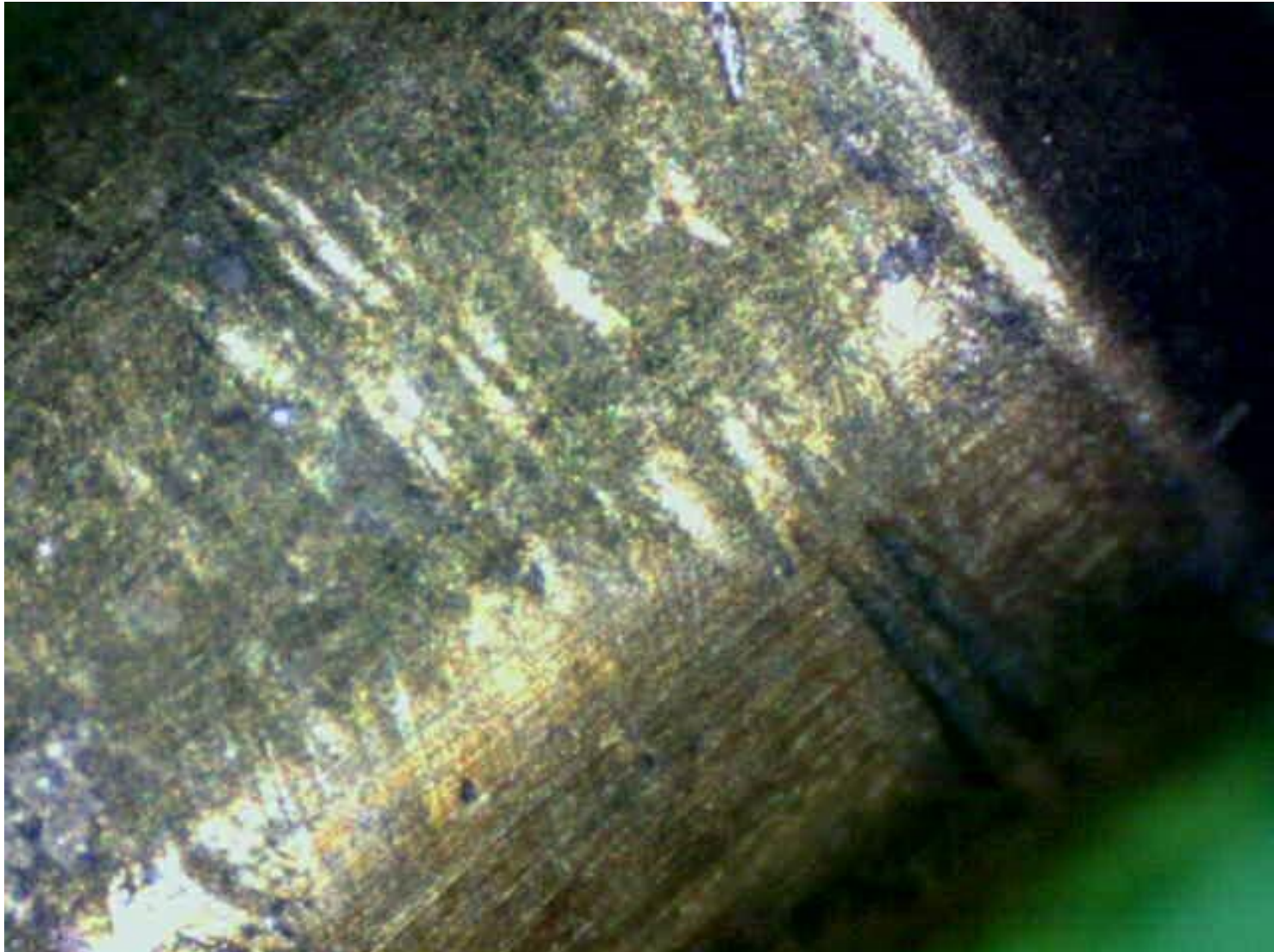
Key Bumping - Plug



Impressioning



Impressioning - Manipulation



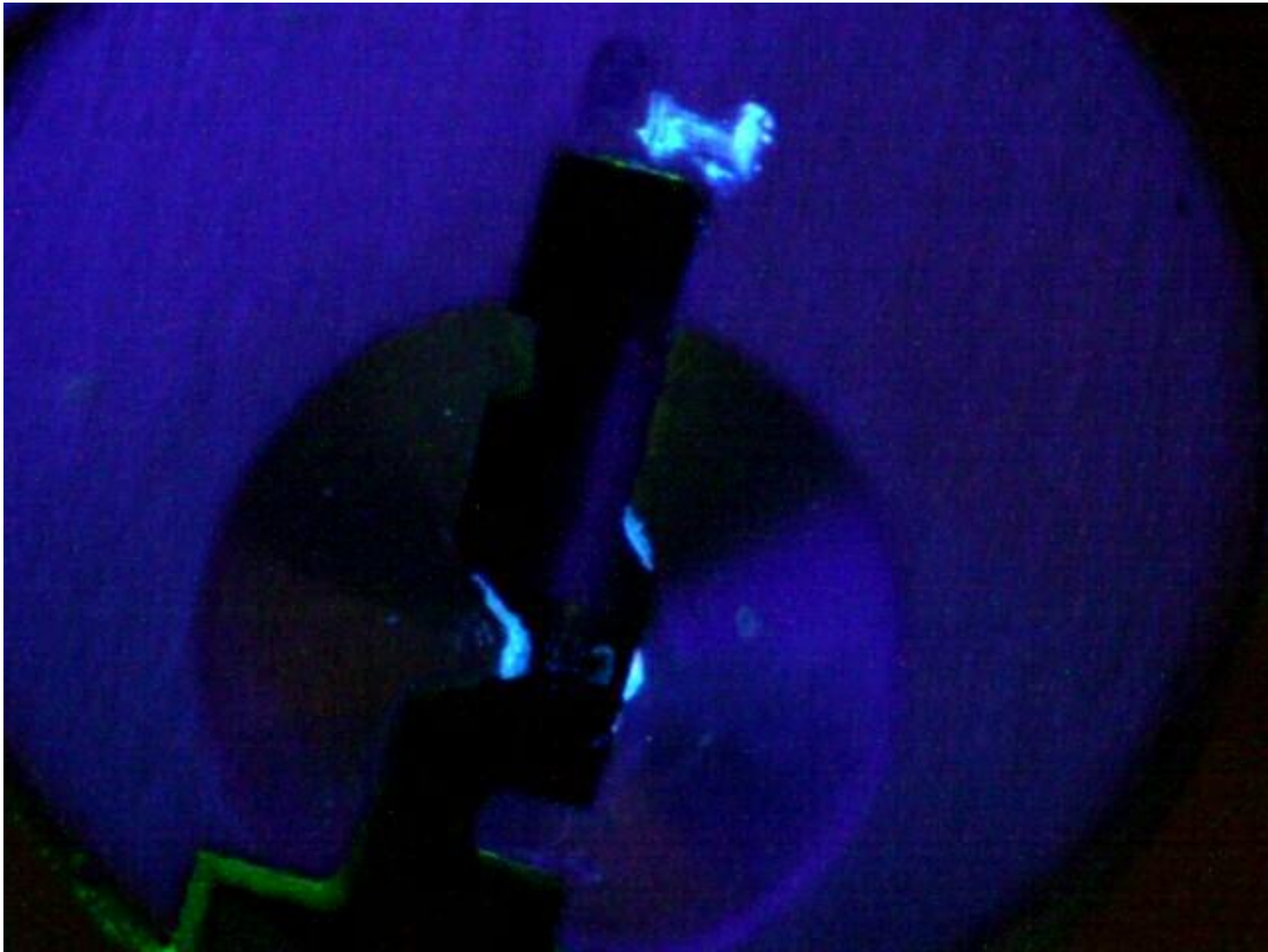
Impressioning - Manipulation



Impressioning - Plug



Impressioning – UV residue



Impressioning – UV Residue



Decoding

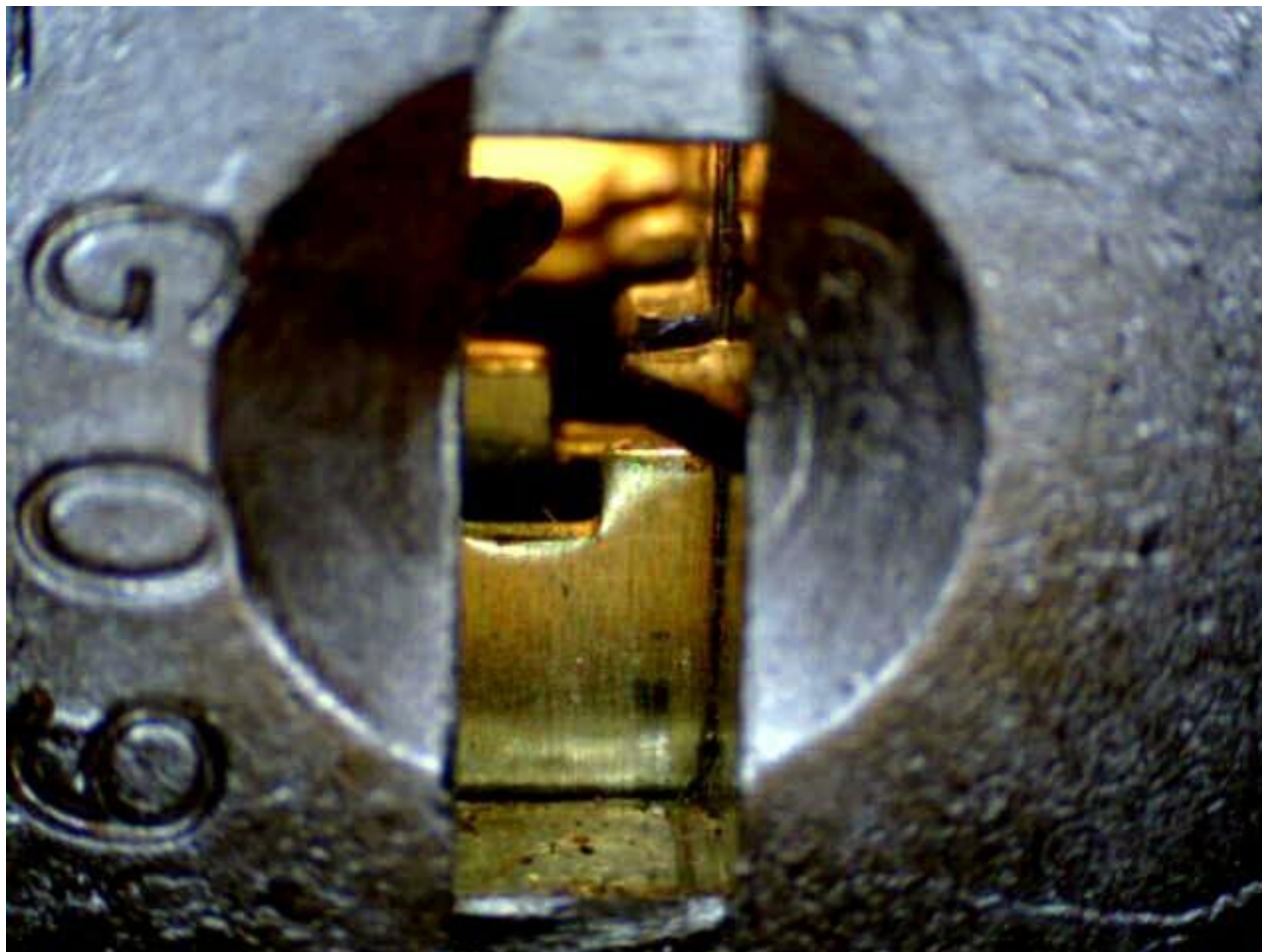
- Depends on technique
- Covert vs. surreptitious

- Decoder “pick”
- Manipulation
- Visual/Optical
- Thermal
- Radiological
- Disassembly

Decoding - Visual

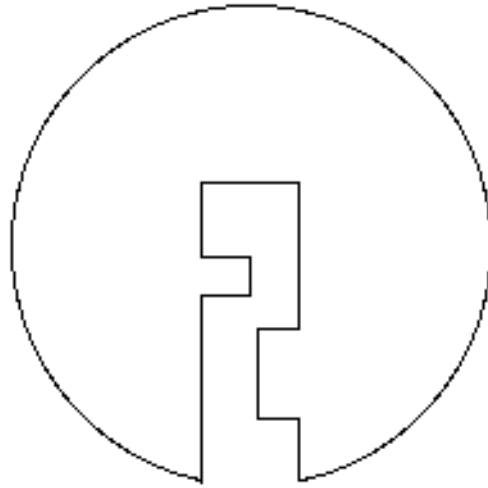


Decoding - Visual

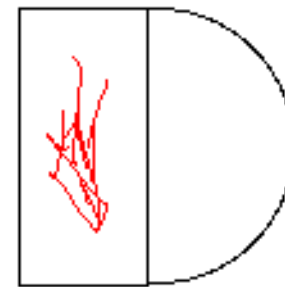
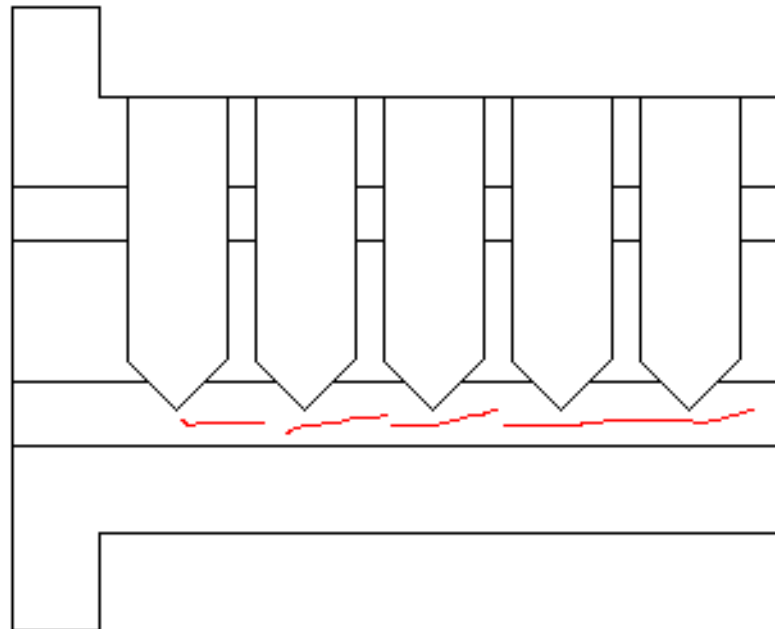


Bypass

Plug

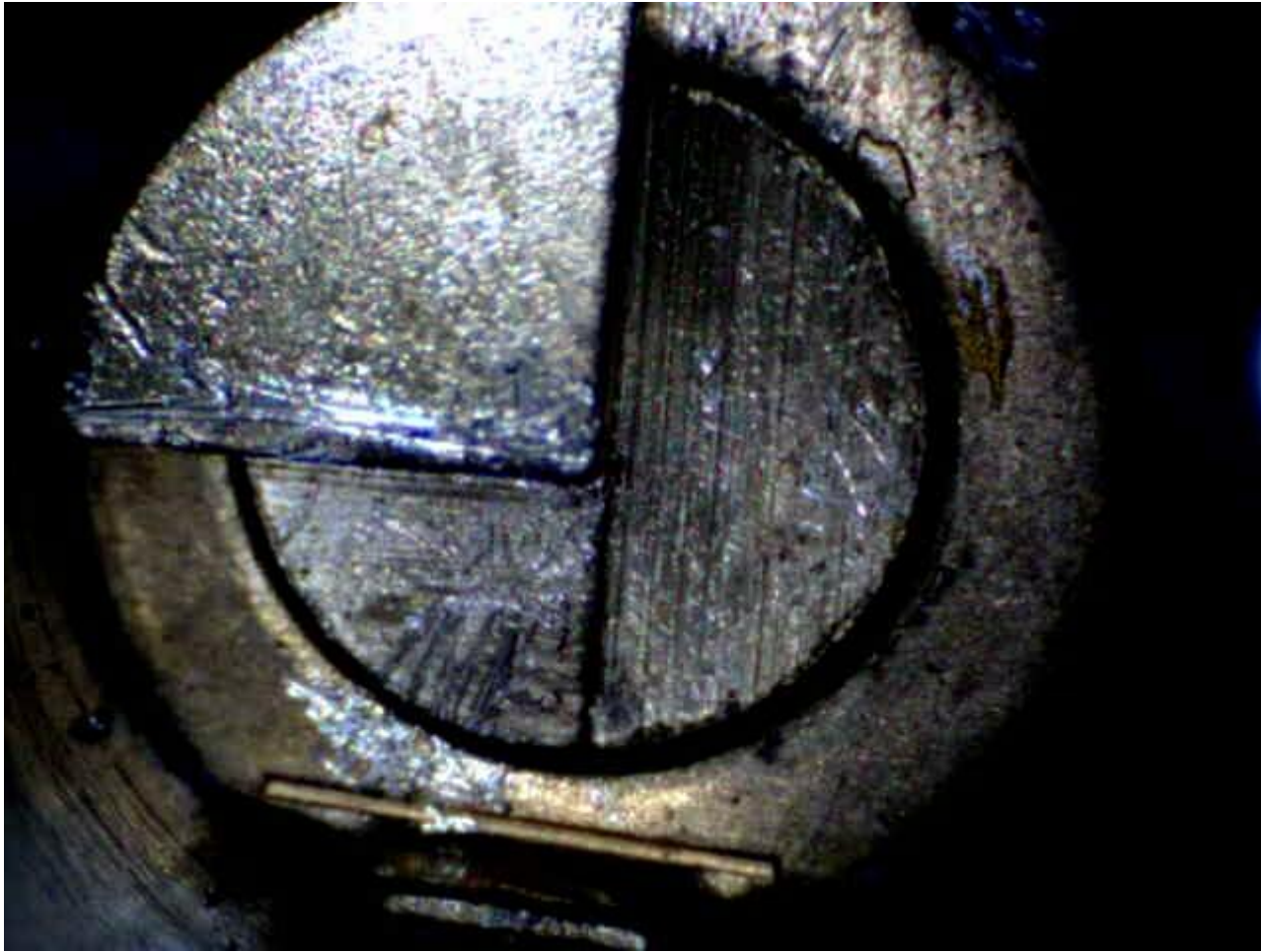


Pins



Cam

Bypass



Bypass



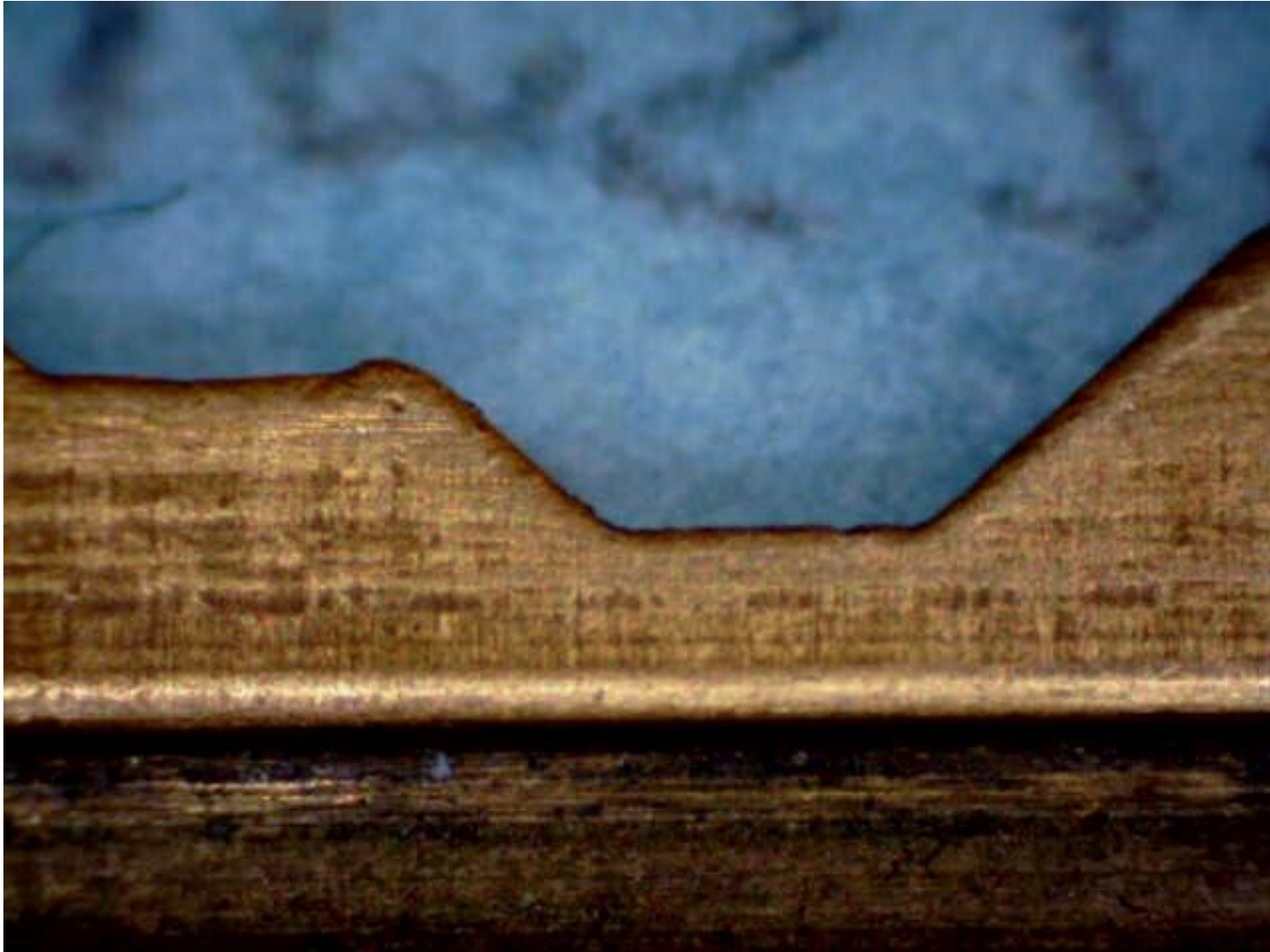
Key Analysis

- Material, keyway, cuts, codes
- Original or duplicate
- Hand cut or machined
- Recent cutting, copying
- Material transfer

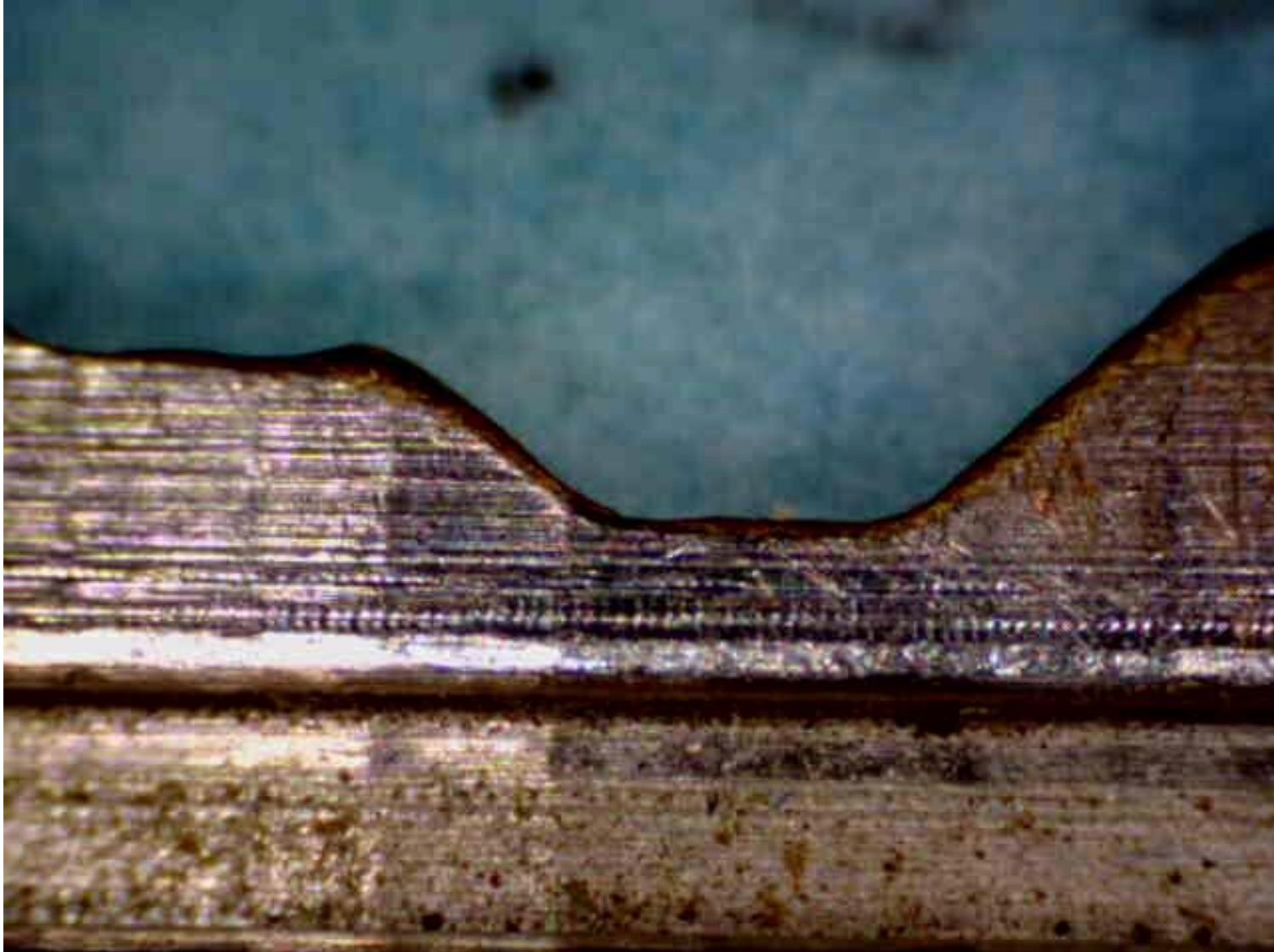
Keys - Plating



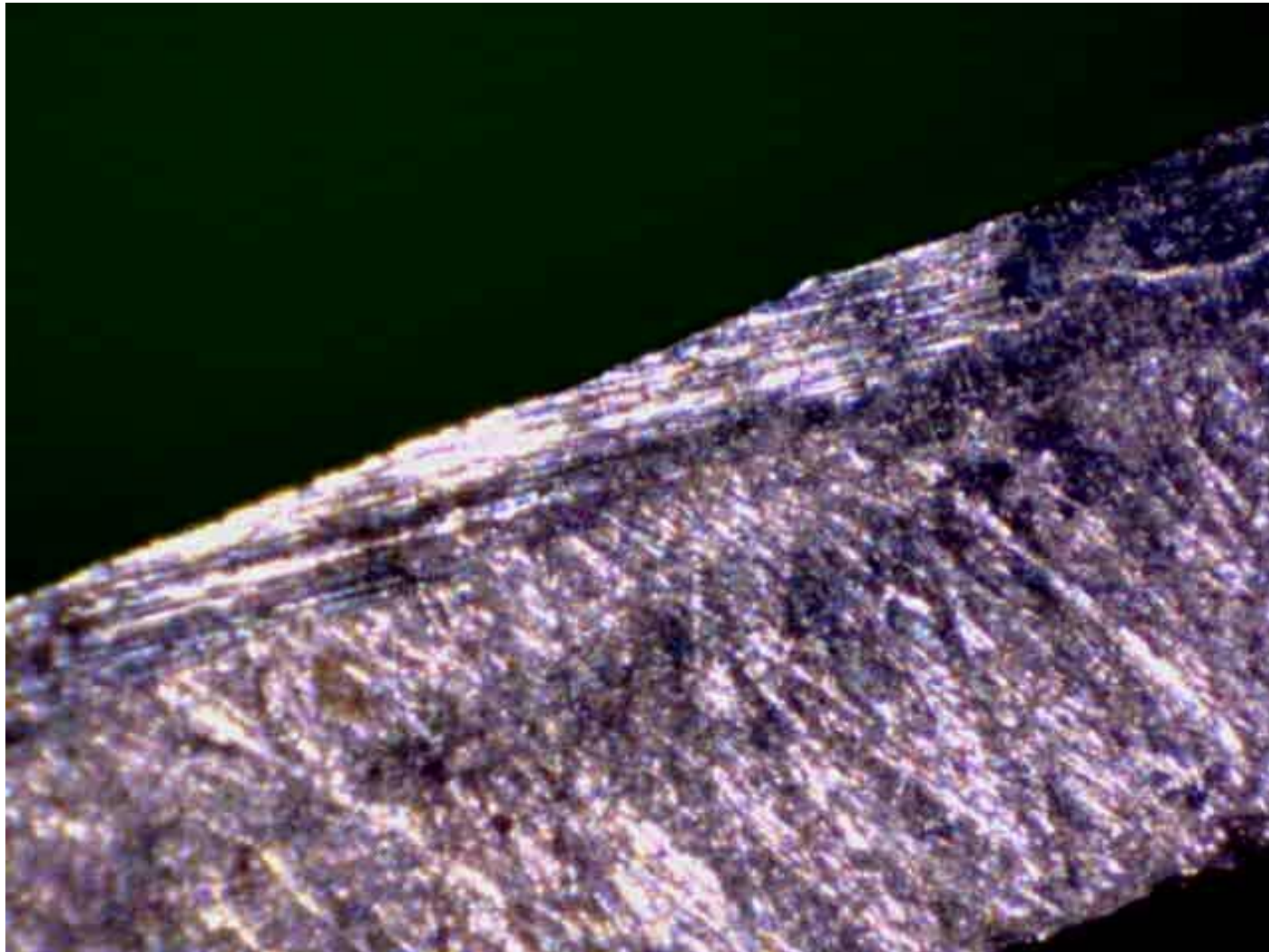
Keys – Original vs Copied



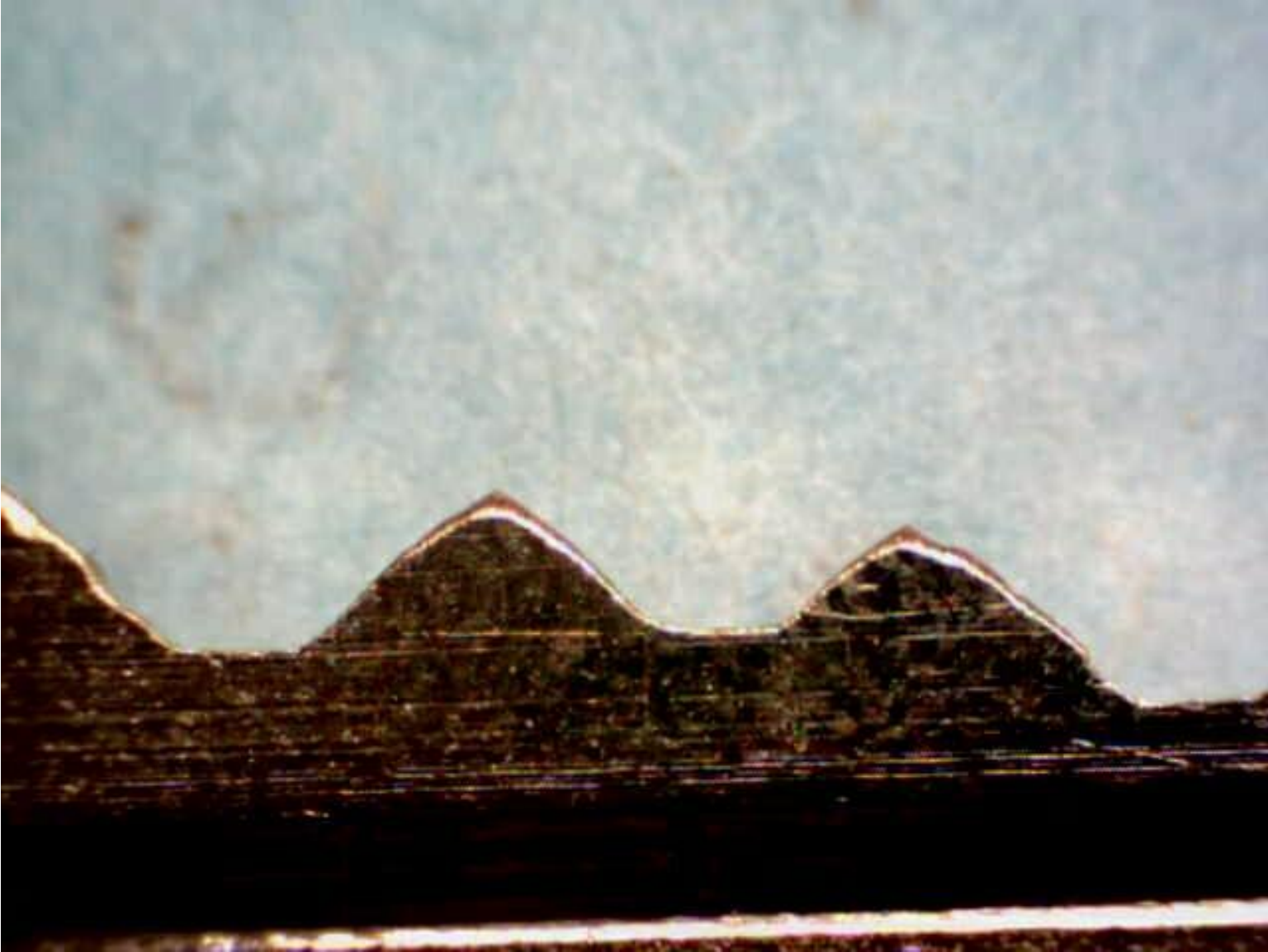
Keys – Original vs Copied



Keys – Stylus striae



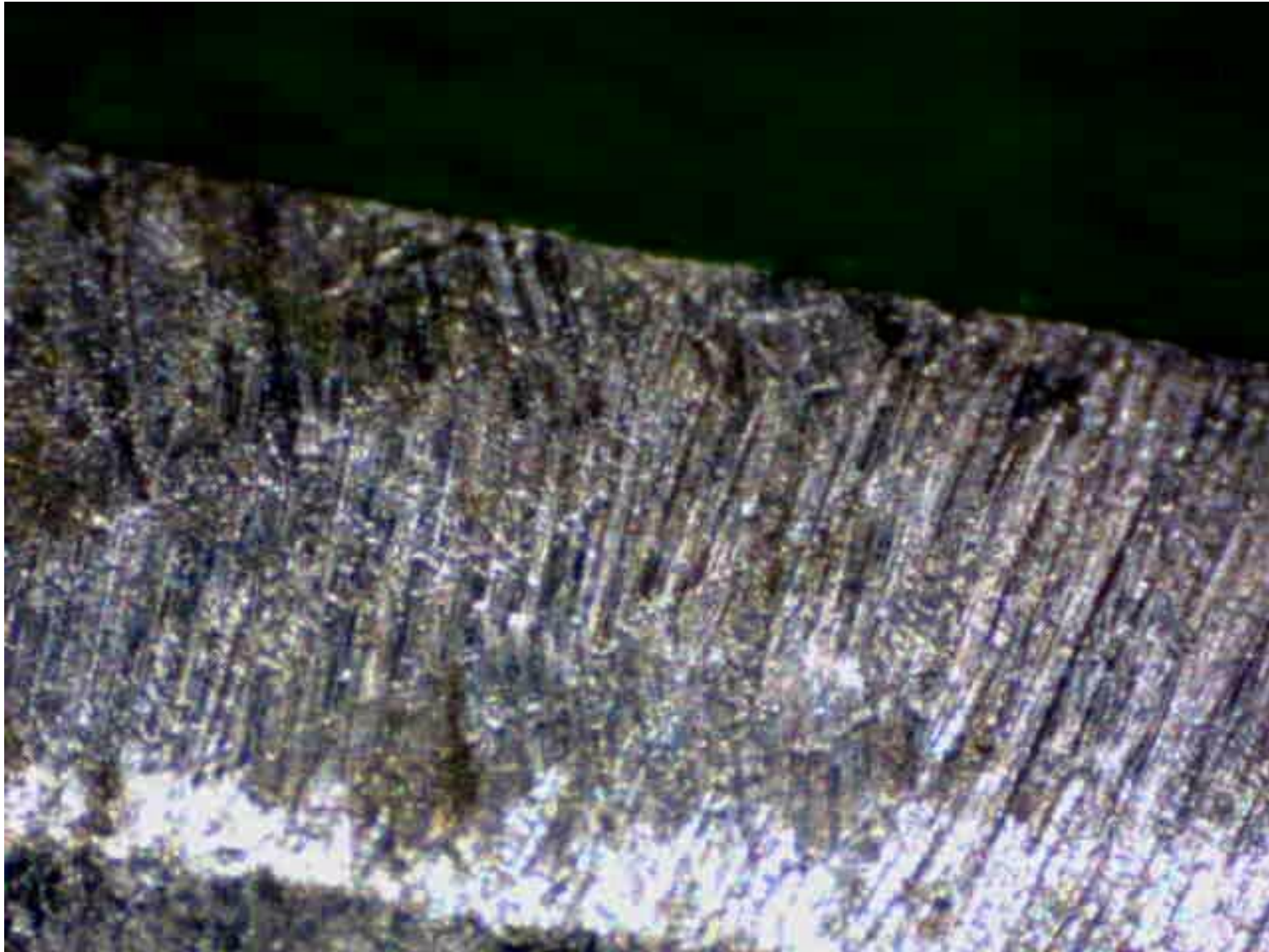
Keys – Hand made



Keys – Filed



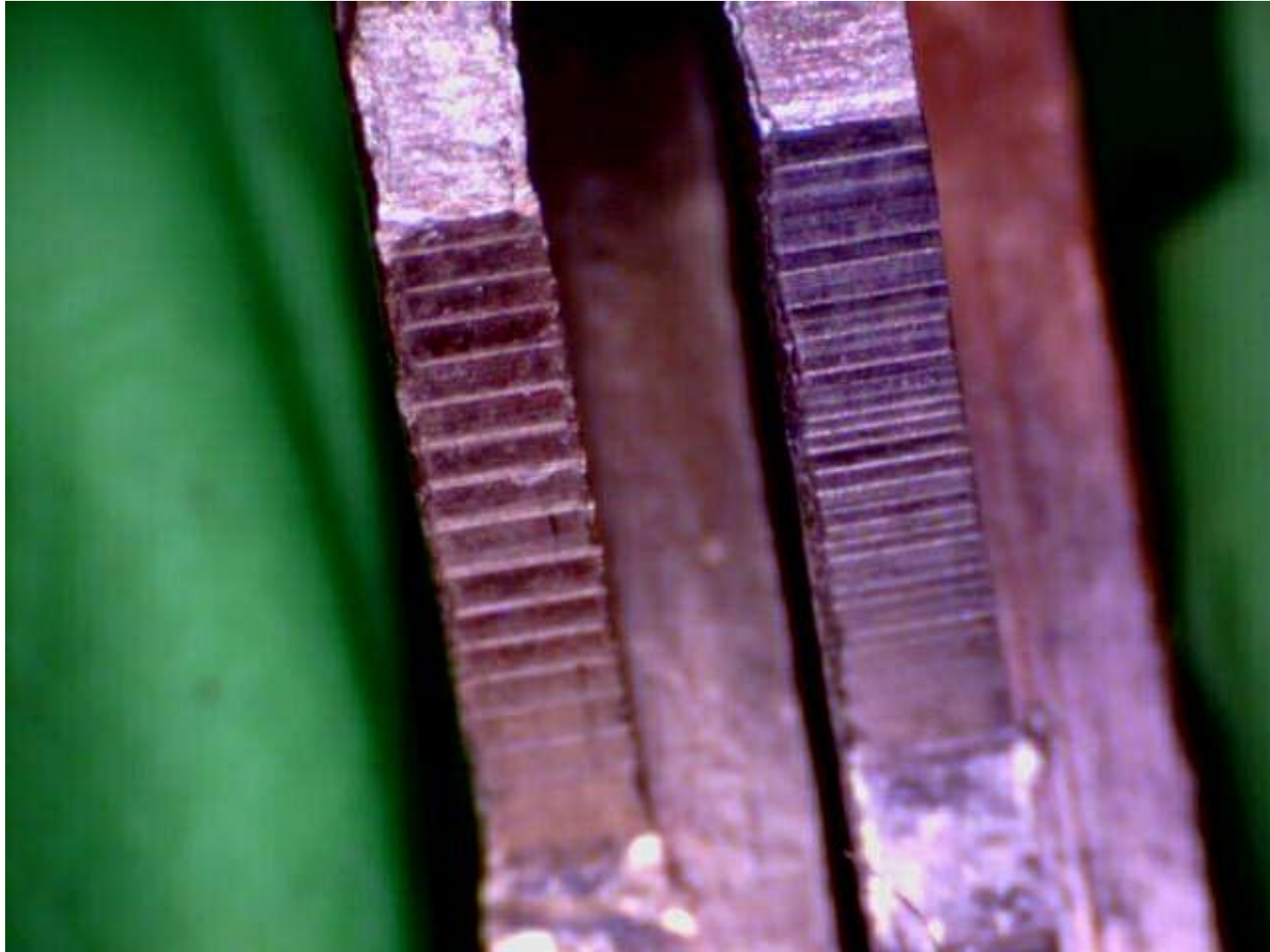
Keys – Filed



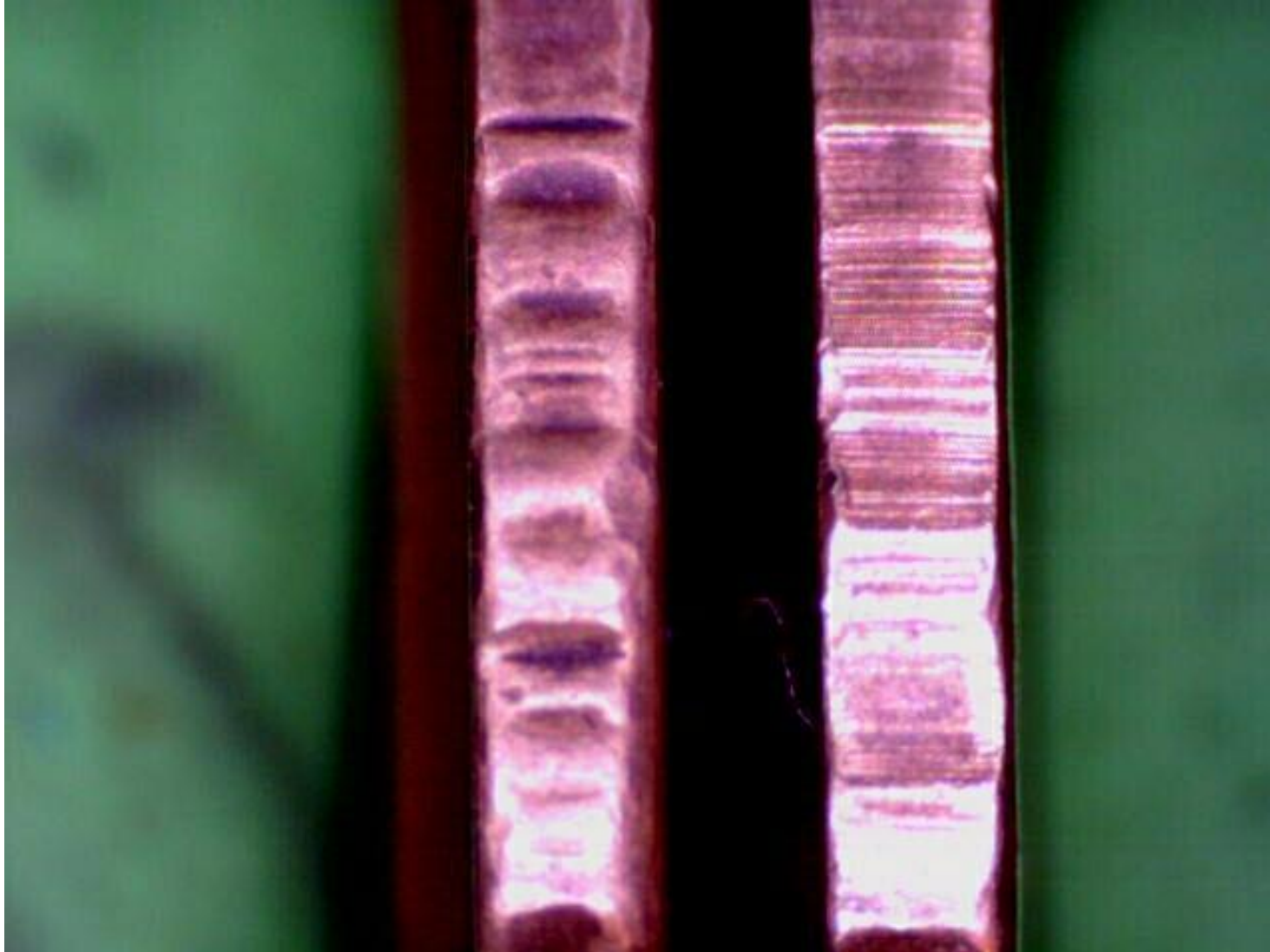
Keys - Dremel



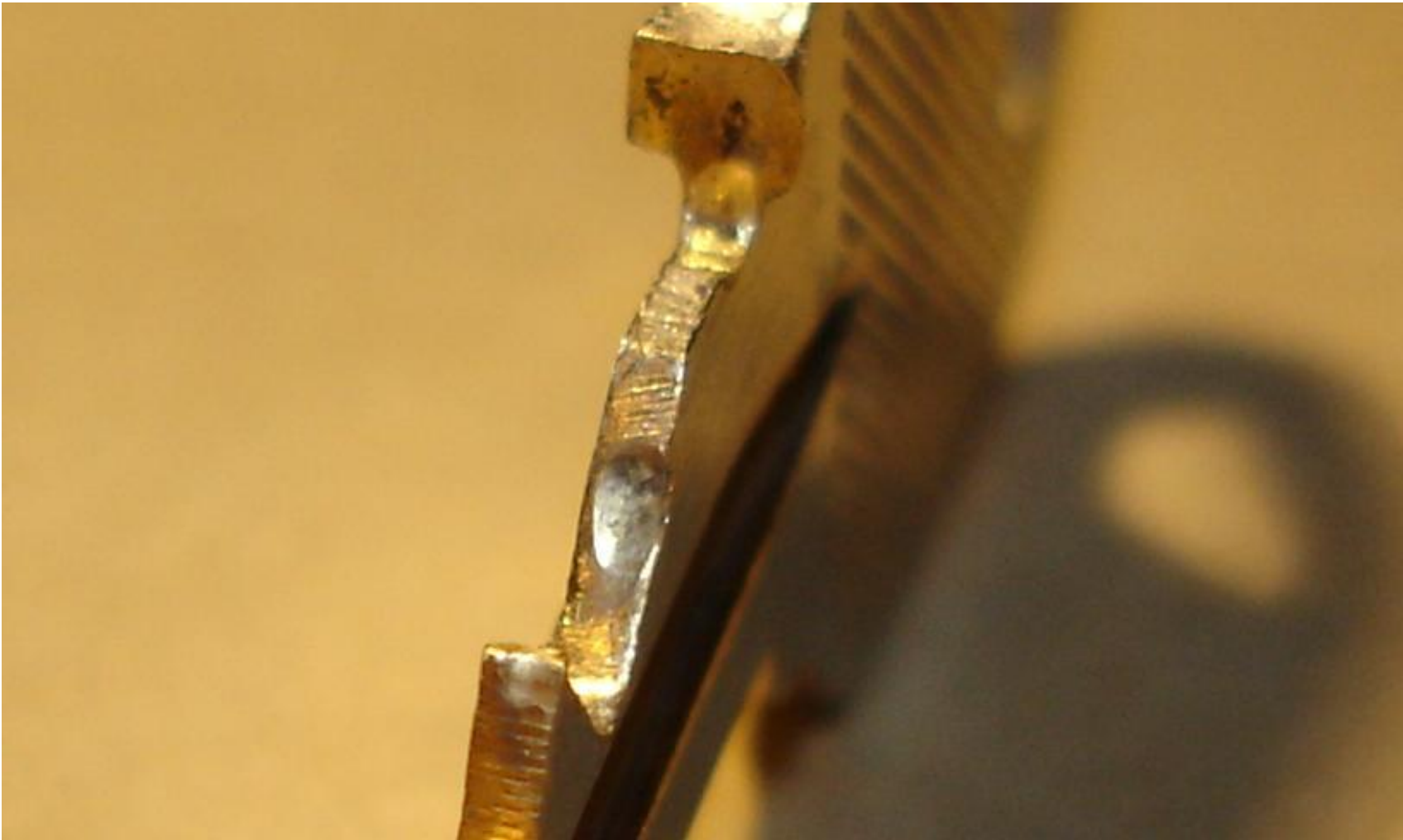
Keys – Cutting Wheels



Keys - Comparison



Key - Bumping



Keys – Bumping



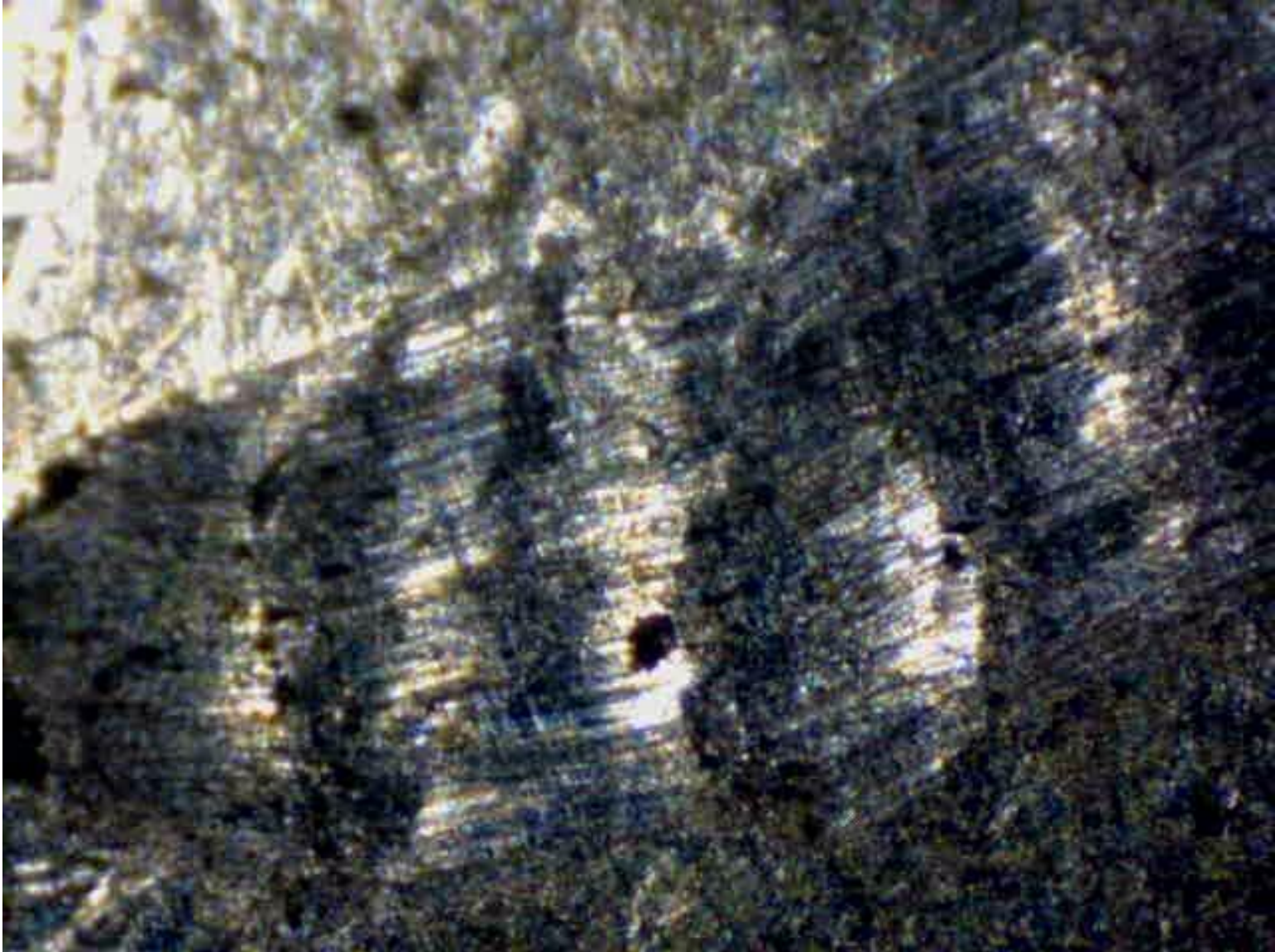
Keys – Tool Marks



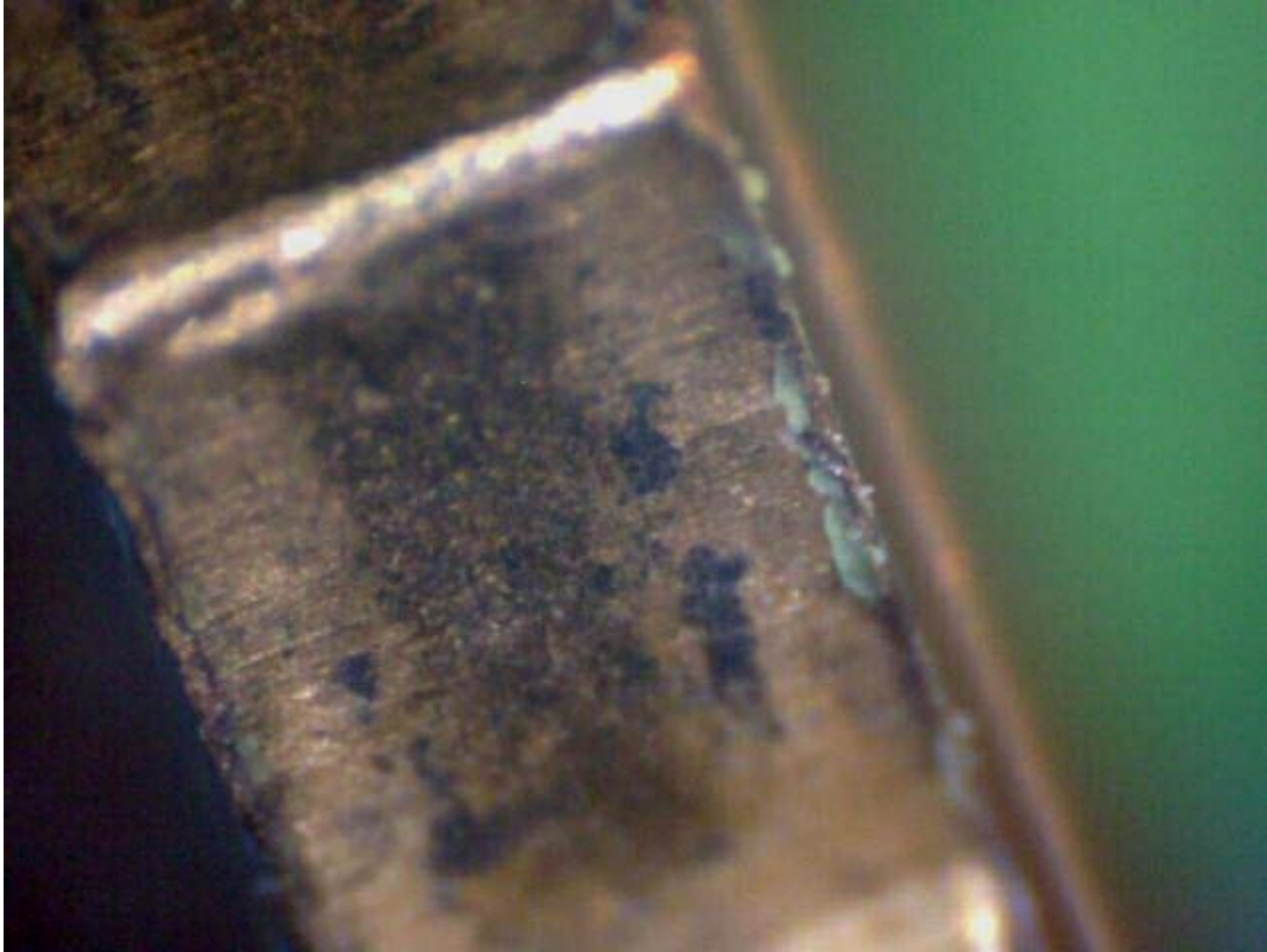
Keys – Tool Marks



Keys – Tool Marks



Keys – Clay residue



Keys – Wax residue



Keys – UV Residue



Anti-forensics Tools?

- Possible!
- Difficult to use
- Limited durability
- Expensive*

Safe/Vault Forensics

- Drill points
- Writing/markings
- Magnetic/adhesive
- Tool marks



Investigative Process

- Crime scene investigation
- Laboratory examination
- Investigative report
- Testimony

Crime Scene Investigation

- Photographs
- Sketches
- Permission issues
- Evidence preservation
- Chain of custody
- Police vs. Insurance

Initial Questions

- Purchase/Installation
- Per day usage
- Security rating(s)
- Key/combo distribution
- Lock condition
 - Working?
 - Repaired?
 - Replaced?

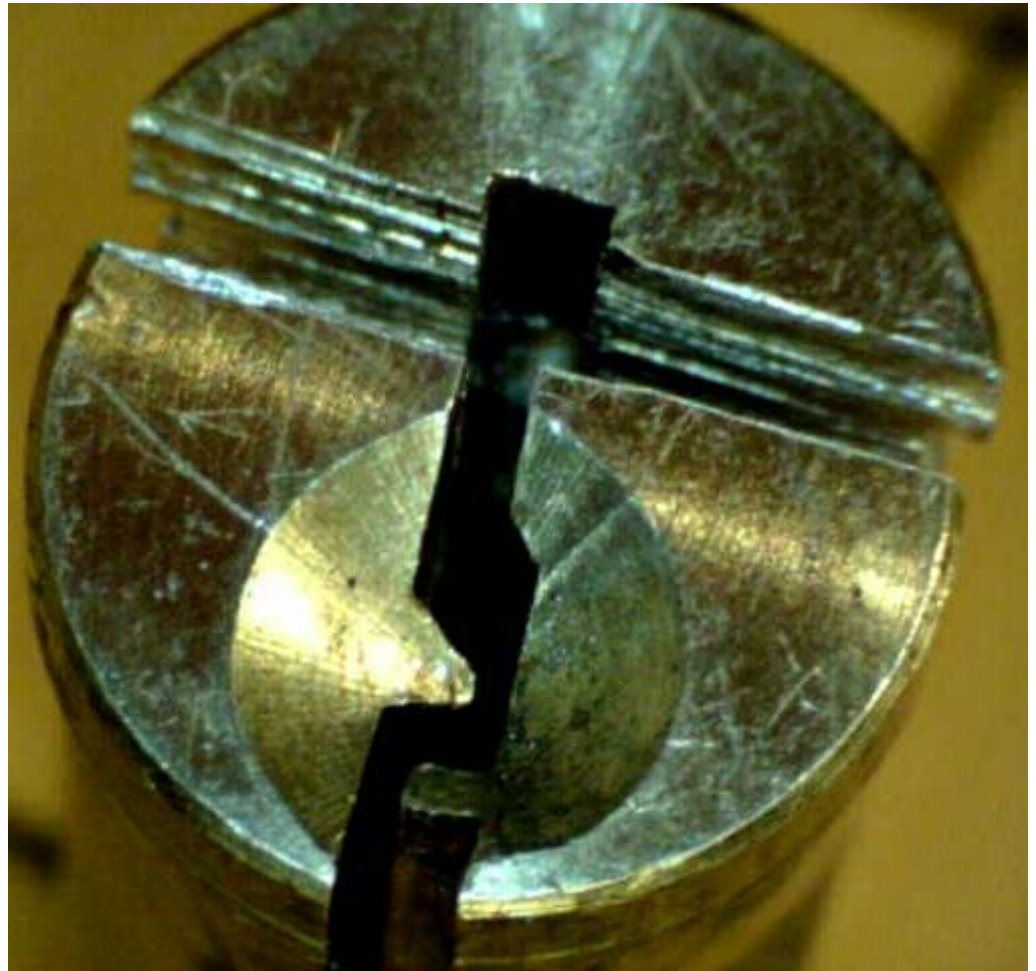
Forensic Examination

- Lock specs & data
- Lock operation
- Lock security rating
- Tool marks
- Material transfer
- Keys

- Do your homework!

Disassembly

- Chamber casings
- Use of key(s)
- Shimming
- Destructive



Shimming



Forensic Workspaces

- Separate!
- Clean area
- Clean/new tools
 - Tweezers, followers, shims
 - Saws
 - Clay
 - Hands/etc

Cleaning of Components

- To clean or not?
- Always look first!
- Evidence destruction
- False evidence creation

Cleaning of Components



Investigative Report

- Findings
- Supporting pictures
- Mirrored locks*
 - Picked
 - Pick gun
 - Bumped
 - Impressioned

Licensing & Certification

- International Association of Investigative Locksmiths (IAIL)

Resources

<http://www.LockpickingForensics.com>

<http://www.LockpickingForensics.com/links.php>

<http://www.LockWiki.com>