Surface observation

Visual methods for mirror surface observation

Observing a normal (dispersive) surface even with a narrow angle objective (microscope) is ok because each point of the surface becomes a point light source with a wide angle ray cone.

Observing a flat (mirror) surface with a narrow angle objective is problematic because if the angular reflection requirement is not fulfilled no light goes into the objective’s observation angle.

Observing reflecting surfaces could be problematic because the image depends strongly on the incident light and camera angle.
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Method one:

The reflection requirement is not met.

That is the case even if the camera is perpendicular to the surface because the microscope viewing angle is narrow and the light source is anyway a little bit displaced from the camera axis. The reflection requirement is not met. The surface image is dark with bright spots from the imperfections that are situated on the right angle and position (only!). Some imperfections may remain hidden.

Example: Flat Al mirror

The camera position is fixed perpendicular to the mirror surface. It looks always at one and the same spot.

The illumination angle changes (with 30° around the camera axis). The imperfections that have the right angle are visible.

It is difficult to evaluate the surface quality!
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Method two:

The reflection requirement is met.

The camera and the light source are positioned in the way that the reflection requirement is met. The surface image is bright (image of the source) with dark spots from the defects. All imperfections (scratches and dirt) are visible because they reflect worse than the flat surface.

Example: Flat Al mirror

The camera position is fixed at a certain angle with respect to the mirror surface

The camera sees the reflected light source image but is focused at the surface.

The dark spots are clearly surface damages because when illumination angle changes and the damaged spot is on the right angle it shines.