

## Fluorite - $\text{CaF}_2$

Hardness: 4. Cleavage: Perfect. Sensitive to thermal shock damage. Soft and easily scratched; avoid metal tools; use only wooden toothpicks or bamboo slivers. There is much mineral literature data on the physical and chemical sensitivities of fluorite, some of it wrong. The information here has been vetted for accuracy.

Macleod and Rohner recommend avoiding sonication, but this technique has been successfully applied to numerous samples without incident.

Generally reported as insoluble to very slightly soluble in water. Stable to  $\text{CO}_2$ -rich water at room temperature but etched by hot distilled water (which precludes the use of hot alkali). Avoid detergents with chelating agents (EDTA, citrate, etc.) as these may cause in dull, etched surfaces. Response to chelators varies between samples; some retain bright luster whereas others become frosted. Therefore, for derusting avoid Iron OUT, Waller's solution and Bridge's solution; use Jacquard Hydro or pure sodium dithionite only. Derusting recipes having chelators may be acceptable for samples already etched, but further etching is likely.

Literature reports on acid resistance are widely inconsistent, suggesting acid sensitivity varies between samples. Oxalic acid causes frosting at room temperature. Fluorite is generally resistant to phosphoric acid of any concentration; this reagent has been widely recommended for derusting but is rarely effective and often not tolerated by other minerals present. Fine powder may be attacked by concentrated  $\text{H}_2\text{SO}_4$  with release of HF gas (Very toxic! Do not attempt!). Bulk crystals show distinct etching in less than an hour. Stable to acetic acid (any concentration), formic acid (any concentration), tartaric acid and citric acid (although one author recommends avoiding the latter two acids). Fluorite is attacked to some extent by concentrated HCl (although some samples tolerate 10% HCl), sulfamic acid and concentrated  $\text{HNO}_3$ . Treatment of fluorite having a dull luster with these last three acids may be acceptable.

Remove calcite with dilute HCl or better still 5-30% acetic acid. 10%  $\text{HNO}_3$  also useful for this purpose.

Tolerates  $\text{NH}_4\text{HF}_2$ , commonly used to weaken or dissolve quartz coatings. The underlying fluorite faces may be naturally etched or (in some cases) etched slightly by  $\text{NH}_4\text{HF}_2$ .

Insoluble in acetone. Tolerates KOH/rubbing alcohol (used for bitumen removal) for weeks.

May be photosensitive; some samples change color and/or fade in sunlight.

### References

Mindat: <https://www.mindat.org/min-1576.html>

Handbook of Mineralogy: <https://www.handbookofmineralogy.org/pdfs/fluorite.pdf>

Duthaler, R. (2006) Cleaning Fluorite in Fluorite, The Collector's Choice, ExtraLAPIS, 126 p.

Lithographie, LLC. East Hampton, Connecticut. pp 117–119.

Fischer, Jesse, personal communication.

Gol, D. (2004b) Removing iron oxides. Le Regne Mineral, 59 (5), 48-50. In French.

Hardinger, S. (2025) Mineral Specimen Cleaning and Development for the Amateur, 339 p.

Kandutsch, G. (1983) About cleaning minerals. Der Karinthin, 88, 11–14. In German.

Macleod, H. (1970) The amateur lapidary. Rocks & Minerals, 45 (12), 755–756.

Mork, J. (2009) Cleaning calcite from fluorite. [www.mindat.org/mesg-135399.html](http://www.mindat.org/mesg-135399.html).

Rohner, T. (2000) Properly clean minerals online cleaning book.

[www.strahlen.org/stepbystep/mineralien-reinigung2.pdf](http://www.strahlen.org/stepbystep/mineralien-reinigung2.pdf). In German.

Sinkankas, J. (1972) Gemstone & Mineral Data Book, 346 p. Winchester Press, New York.

Weast, R., Ed. (1982) CRC Handbook of Chemistry and Physics, 2380 p., CRC Press, Inc., Cleveland.