The Fascination of Crystals and Symmetry

Unit 3.2

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Rotational symmetry

- 4-fold axis of rotation
- 16-fold axis of rotation
- 25-fold axis of rotation
Rotational symmetry

- single objects can have rotational symmetry of any order
- rotational symmetry may or may not be combined with mirror symmetry

SO = Rotation by 360° / n  
SE = n-fold axis of rotation  
symbol n (1, 2, 3...)
Combination of Mirror and Rotational symmetry

- single objects can have rotational symmetry of any order
- rotational symmetry may or may not be combined with mirror symmetry

5-fold axis of rotation
1 unique mirror plane

6-fold axis of rotation
2 unique mirror planes
Combination of Mirror and Rotational symmetry

- single objects can have any rotational symmetry whatsoever
- rotational symmetry may or may not be combined with mirror symmetry

- any pair of two orthogonal mirror planes generate a two-fold axis of rotation at their intersection line
Axis of Rotation – Summary

Axis of Rotation...

- rotation around an axis (= fixed points of the rotation) with an angle of rotation $\alpha$
- after $n$ rotations by $\alpha$ the starting position is reached
- $n = \text{order of the axis}$
- the number of crystal classes is limited to 32 because of the restrictions of rotational symmetry in crystals

... in crystallography

- $\alpha = 180^\circ$ 2-fold
- $120^\circ$ 3-fold
- $90^\circ$ 4-fold
- $60^\circ$ 6-fold

$n = 2, 3, 4, 6$
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