Twinning–octahedrally crystalline & octahedrally quasicrystalline

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http://homepage.mac.com/whitby/

http://web.me.com/whitby/Octahedron/Welcome.html

References

Octahedron1stEd.pdf
Repeated twins–See bookmarks MINERAL: Chrysoberyl, Cerrusite
Penetration twins–See bookmarks MINERAL: Tetrahedrite, Staurolite

John Sinkankas, Mineralogy, Van Nostrand Reinhold Co., New York, 1964
Figure 39, page 98
Figure 40, page 99

Introduction

Crystalline forms which have symmetries other than twofold, threefold, fourfold, or sixfold are called quasicrystalline. In a crystal, the octahedra which compose the atoms are in identical orientation throughout the crystal; in a quasicrystal, the octahedra have more than one orientation. There are twins which have crystalline symmetry, but the octahedra of which their atoms are composed have more than one orientation. Twins of spinel and fluorite.which are octahedrally quasicrystalline are shown herein. Compare them with the octahedrally crystalline twins of chrysoberyl, cerrusite, phillipsite, tetrahedrite, and staurolite in the reference.

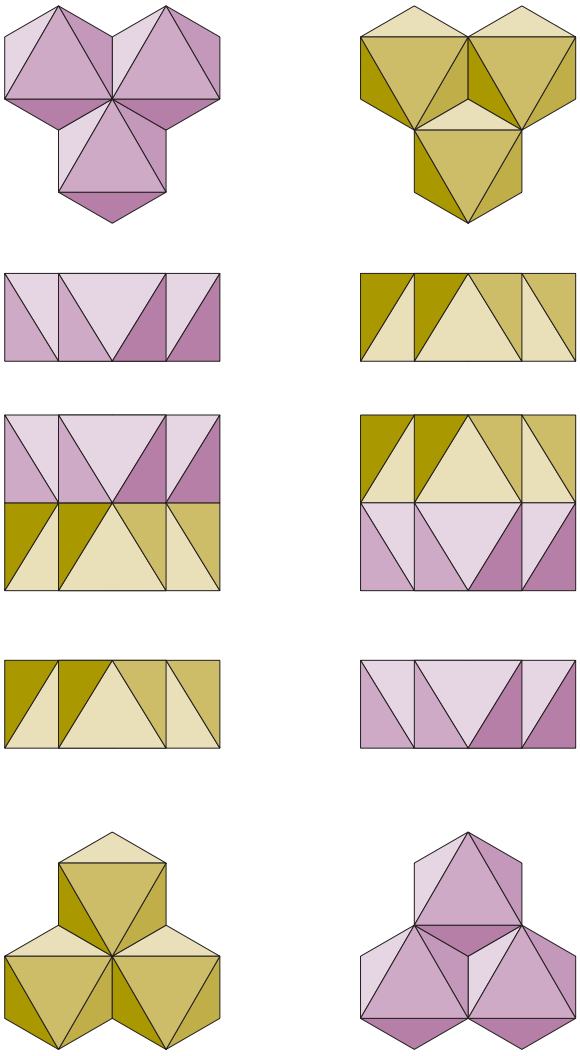


Fig 1–Octahedrally quasicrystalline joining of triplets

The figure show how two triplets can join facially in two ways. Each triplet is shown in a facial view at top and bottom of the two columns. The joined triplets are shown in the middle positions of the two columns. On either side of the middle position, the triplets are shown separately in the joining orientation.

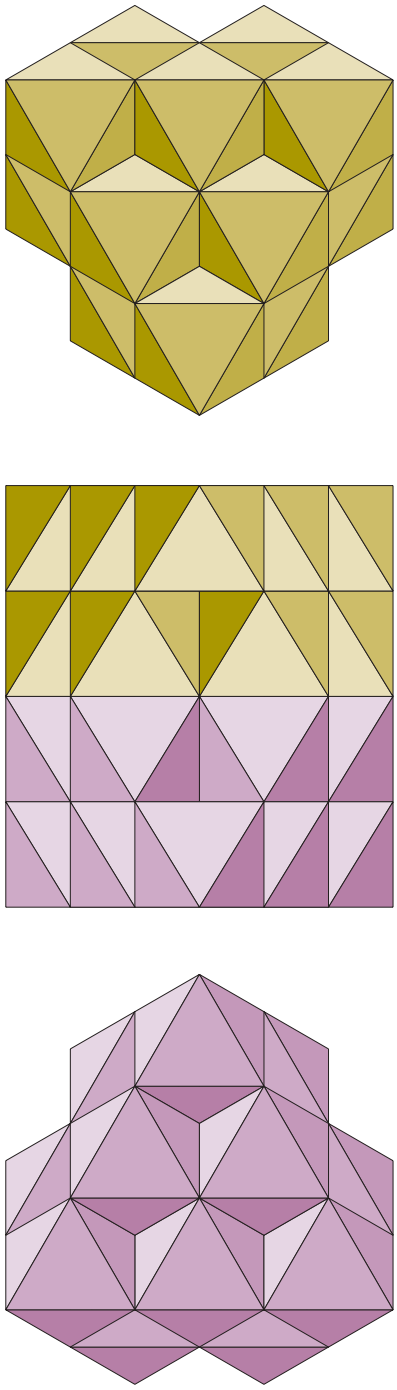


Fig 2–Spinel–contact twin

The identical partial compound octahedral groups at top and bottom join octahedral facially in the middle of the column. This is geometrically similar to a contact twin found in spinel.

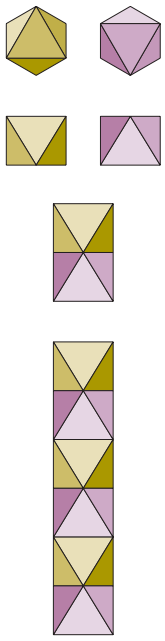
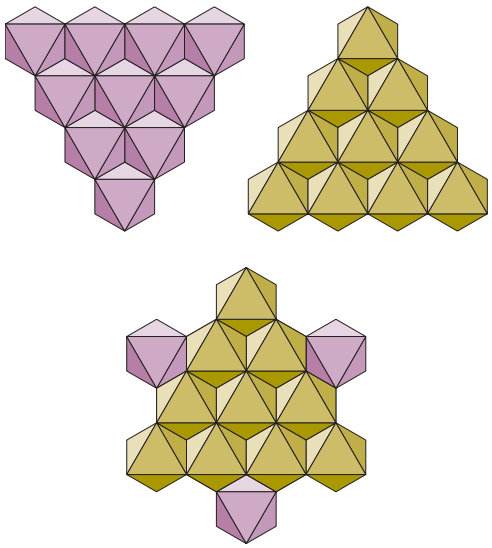


Fig 3–Fluorite–penetrant twin

A penetrant twin of fluorite resembles two cubes with a common vertexial diameter. A cube defined by identical regular octahedra has a vertexial diameter which is parallel to a facial diameter of the octahedra. The twin requires that the octahedra of one cube be facially joined to the octahedra of the other cube. The figure shows this structure. An octahedron from each cube is shown facially at the top. The two octahedra are then viewed parallel to their joining faces. The facially joined pair is shown next. A column of facially joined octas is next–this is the common diagonal of the twinned cubes.

A planar group of octahedra using each of the two orientations is shown separately next the to bottom of the figure. The two groups are joined facially at the bottom. The centroidal octahedra could lie on the common vertexial diameter of the cubes.



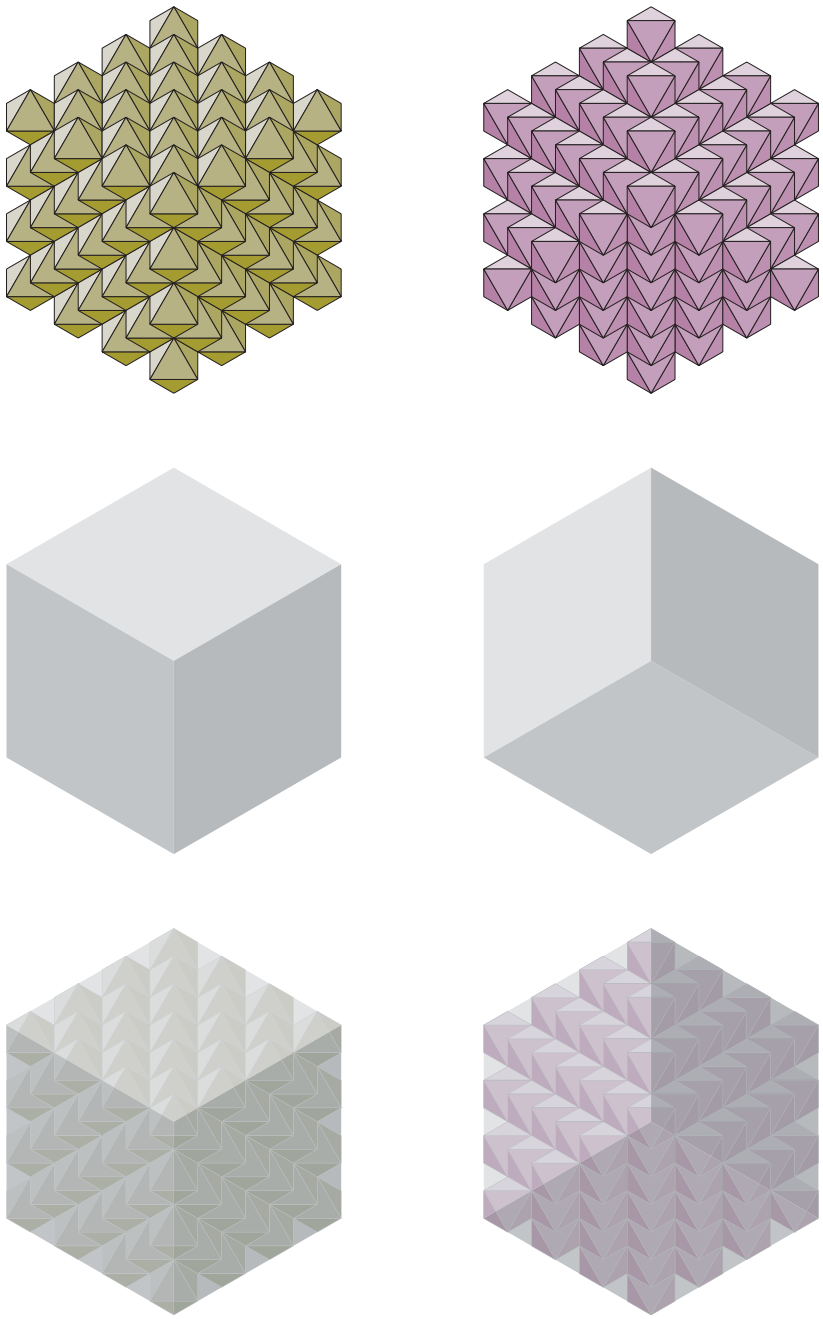


Fig 4–Fluorite–two cubes with parallel vertexial diameters

Two cubes made of identical octahedra are shown at the top of the figure. Each octahedron of the cube on the right is rotated 60-degrees about a facial diameter relative to each octahedron of the cube on the left. An octahedron of one cube can facially join with an octahedron of the other cube without a change in orientation. This is the relationship of the two cubes of the penetrant twin of fluorite. The second row of the figure shows the cube defined by the vertexes of the octahedra. At the bottom, the octahedral assemblies are enclosed by the cubes of the middle row.

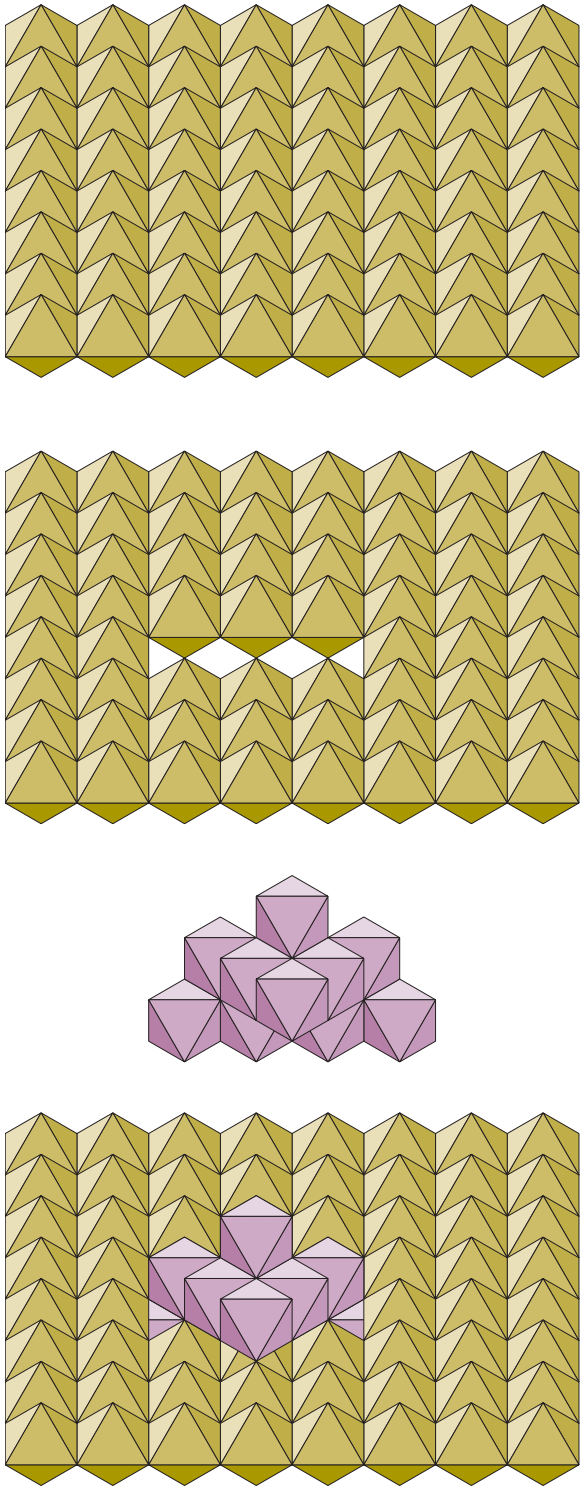


Fig 5–Fluorite–cube vertex emergent from face of second cube

At the top of the figure, a vertexial plane of identical octahedra represents the surface of a cube formed of identical octahedra. Next below, the same plane is shown with three of its octahedra removed. Next, the vertex of a second cube is defined by identical octahedra. At the bottom, the vertexial group of the second cube has been facially joined to the vertexial plane of the first cube. This is the relationship of cube to cube in the penetrant twin of fluorite.