

Semiconductor crystals–layer-to-layer joining

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20 September 2005

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

References

1. Octahedron, the Universe defined by Robert William Whitby

A description of the atomic shapes and how they join which follows from the discovery that the periodicity of the atomic elements matches the periodicity of recurring form in which identical regular octahedra combine to form ever larger regular octahedra. Octahedron1stEd.pdf shows that the atomic elements are crystalline assemblies of identical regular octahedra and explores the implications of this discovery. 500 pages

See the chapter CRYSTAL.

<http://homepage.mac.com/whitby/FileSharing103.html>

2. Tetrapod structure by Robert William Whitby

This document shows how a Zn-atom and an O-atom can join to form a Sr-atom homomorph. The ZnO-group can join with identical groups to form the tetrahedral structure which is called a *tetrapod*.

<http://homepage.mac.com/whitby/Crystals/FileSharing215.html>

3. Mn-atom doping of 100-planes of ZnSe crystal by Robert William Whitby

This document shows the atoms, the formation of the ZnSe-group, a crystalline assembly of identical ZnSe-groups, and the ways in which a Mn-atom can join to each of the crystal surfaces that are parallel to one of the three mutually perpendicular planes. It shows how a Mn-atom can join with the ZnSe-groups which define each of the two types of 100-plane. It also shows that two Ge-atoms can join as a unit which is a homomorph of the ZnSe-group.

<http://homepage.mac.com/whitby/Crystals/FileSharing217.html>

4. Semiconductor crystals composed of two-atom CFUs by Robert William Whitby

The pairing of elements in both elemental and compound semiconductors are identical in their ability to join so that their joining He-octas and triplets are arranged as a square layer of four He-octas. The file SemiConCry.pdf shows each such pairing in both a vertexial view and a facial view and shows four identical pairs joined in a crystalline layer. The 184 page file contains 182 full page figures.

<http://homepage.mac.com/whitby/Crystals/FileSharing219.html>

5. The Atomic Elements arranged in the order of their periodicity by Robert William Whitby

PerTbl40wide.pdf shows the Atomic Elements arranged in periodic order on an 11" x 40" page suitable for matting and mounting using standard dimension materials.

<http://homepage.mac.com/whitby/AtomicElements/FileSharing218.html>

Introduction

This document shows seventeen different types of semiconductor crystals that result from the two atom CFUs of Reference 4. Each type is shown in two figures. One figure includes three depictions—a lone CFU in He-octa detail, four CFUs showing the intralayer joins, five CFUs showing the interlayer joins. The other figure shows five CFUs in three adjoining layers viewed in an edgial projection that is parallel to the layers.

Each type of semiconductor CFU is composed of square layers of He-octas. Each CFU has a 2-layer which is formed by the addition of He-octas and epn-triplets contributed by each of the two atoms. Table 1 lists each of the CFU types. The types are grouped according to the number of layers composing the CFU. Types 3A, 3B, and 3C each have five layers and each layer is the same size as the corresponding layer within each of the CFUs. But each of the CFUs has a different shape which results in different displacements of adjoining crystal layers. Type 3D has a midlayer of a different size than types 3A, 3B, and 3C and this results in different spacing between adjoining CFUs within the crystalline layer.

The layer displacement gives the address of a CFU of one crystal layer relative to an adjoining CFU of a second crystal layer.

Table 1: Semiconducting crystals composed of two-atom CFUs

Type	Number of He-octa layers	Sizes and order of He-octa layers	Interlayer displacement of CFUs in a crystal			Atom pairs of CFU
			x	y	z	
1	3	121	2	0	2	CC
2	4	1221	-3	0	3	CSi
3A	5	12221	-1	-3	4	SiSi
3B			3	1	4	
3C			-4	0	4	
3D		12321	3	0	3	BAs, CGe, GaN, ZnO
4A	6	123321	-4	0	4	BSb, CdO, CSn, InN
4B		122321	0	-4	4	AlAs, SiGe, ZnS, GaP
5A	7	1223321	-4	-1	5	AlSb, CdS, InP, SiSn
5B		1234321	-4	0	6	BBi, CPb, HgO, TiN
5C		1232321	-3	0	5	GeGe, ZnSe, GaAs
6A	8	12234321	0	-5	5	AlBi, HgS, SiPb, TiP
6B		12323321	-4	0	6	CdSe, GeSn, ZnTe, GaSb, InAs
7A	9	123234321	-4	0	6	HgSe, ZnPo, GaBi, TiAs, GePb
7B		123323321	-4	-1	7	CdTe, SnSn, InSb
8	10	1233234321	0	5	7	CdPo, HgTe, PbSn, InBi, TiSb
9	11	12343234321	-4	0	8	BiTi, HgPo, PbPb

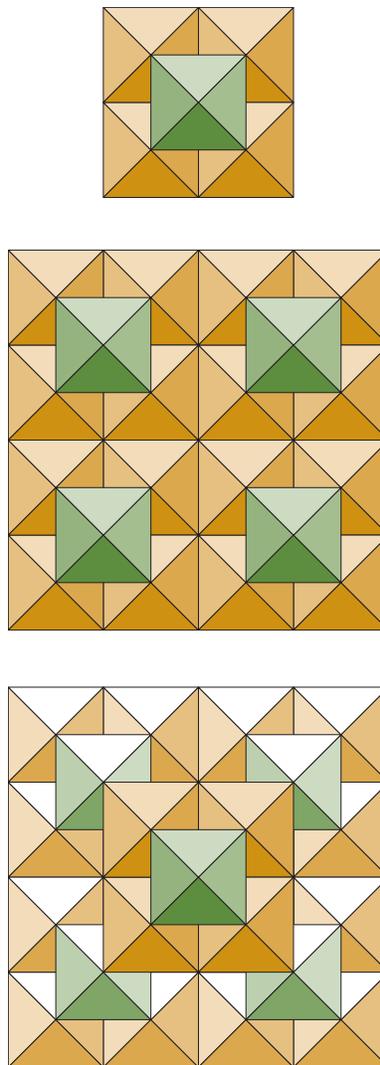


Fig. 1 Semiconductor CFU Type 1

The Type 1 CFU is formed by two C-atoms. Each C-atom contributes two He-octas to the 2-layer. The CFU has the form of a Mg-atom.

At top, the CFU is shown in a vertexial view.

At middle, four CFUs are arranged edge to edge as a square showing the intralayer relationship of adjoining CFUs within a Type 1 crystal.

At bottom, a fifth CFU is joined to each of the four CFUs of the square showing the interlayer relationship of adjoining CFUs within a Type 1 crystal.

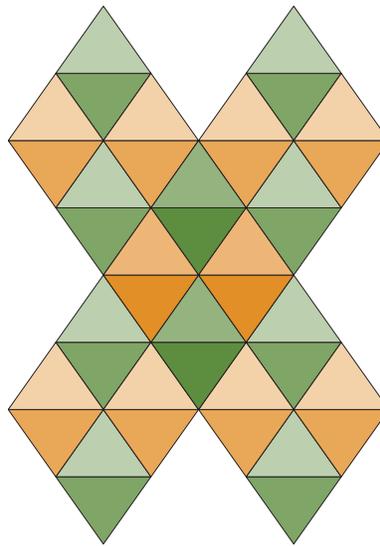


Fig. 2 Semiconductor crystal Type 1–edgial view

The figure shows the relationship between the CFUs of three adjoining layers of a Type 1 semiconductor crystal.

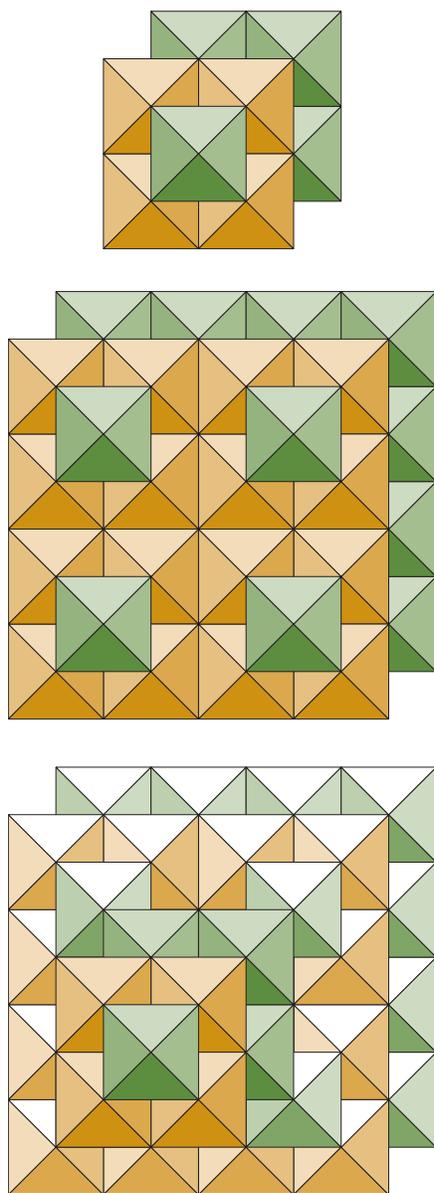


Fig. 3 Semiconductor CFU Type 2

The Type 2 CFU is formed by one C-atom and one Si-atom, Each atom contributes two He-octas to the 2-layer. The CFU has the form of a Ca-atom.

At top, the CFU is shown in a vertexial view.

At middle, four CFUs are arranged edge to edge as a square showing the intralayer relationship of adjoining CFUs within a Type 2 crystal.

At bottom, a fifth CFU has been joined to each of the four CFUs of the square to show the interlayer relationship of adjoining CFUs within a Type 2 crystal.

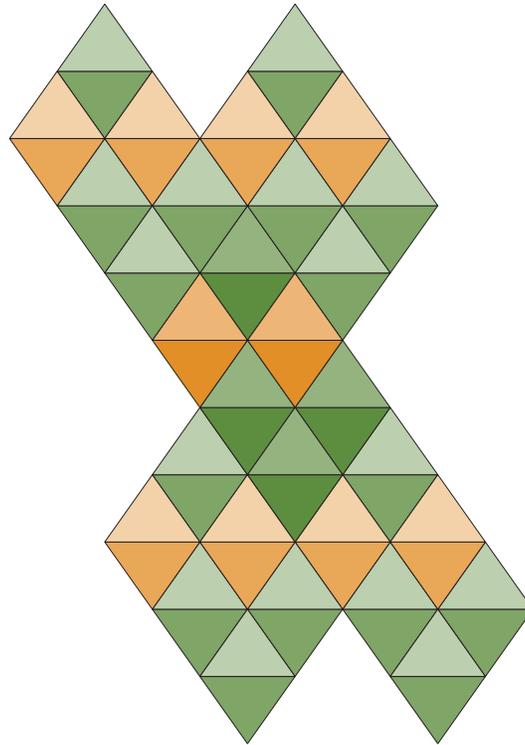


Fig. 4 Semiconductor crystal Type 2–edgial view

The figure shows the relationship between the CFUs of three adjoining layers of a Type 2 semiconductor crystal.

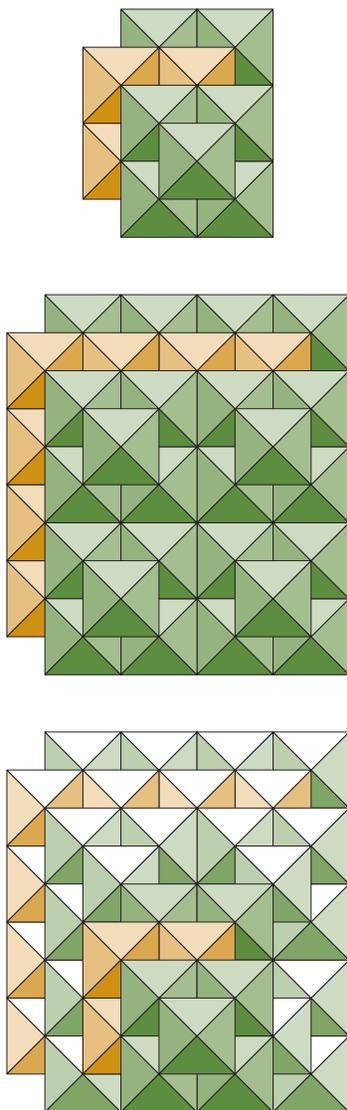


Fig. 5 Semiconductor CFU Type 3A

The Type 3A CFU is formed by two Si-atoms. Each Si-atom contributes two He-octas to the 2-layer which is colored orange.

At top, the CFU is shown in a vertexial view.

At middle, four CFUs are arranged so that their larger layers are joined edge to edge as a square showing the intralayer relationship of adjoining CFUs within a crystal.

At bottom, a fifth CFU is joined to each of the four CFUs of the square showing the interlayer relationship of adjoining CFUs the crystal.

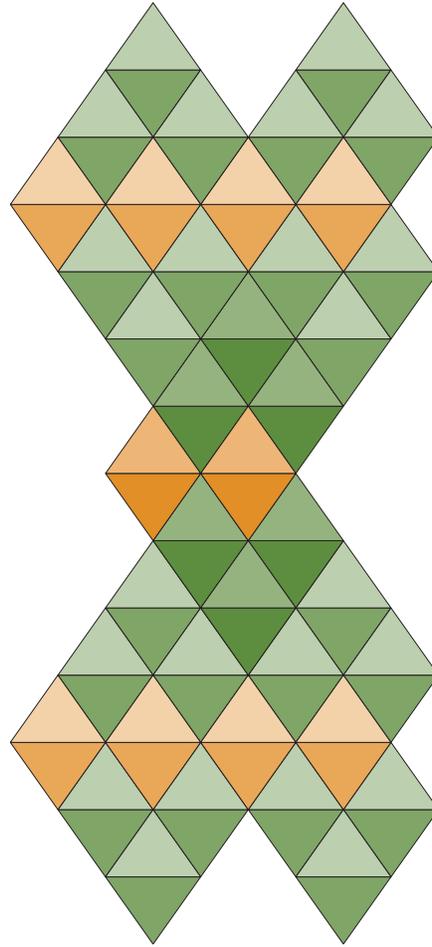


Fig. 6 Semiconductor crystal Type 3A—edgial view

The figure shows the relationship between the CFUs of three adjoining layers of a Type 3A semiconductor crystal.

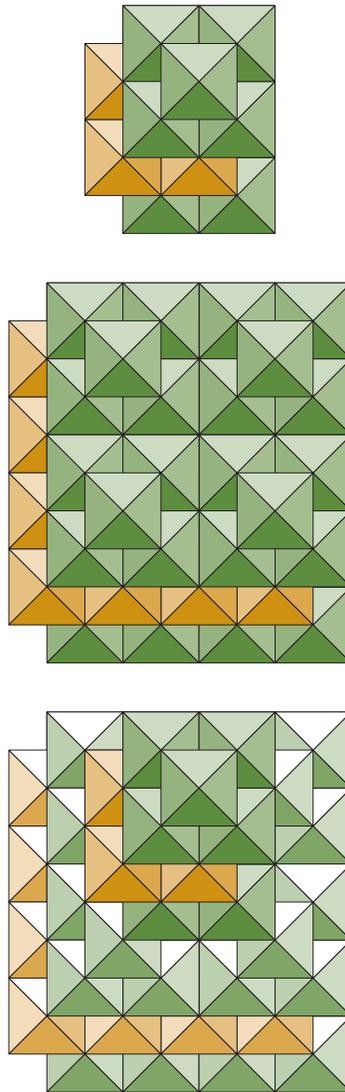


Fig. 7 Semiconductor CFU Type 3B

The Type 3B CFU is formed by two Si-atoms. Each Si-atom contributes two He-octas to the 2-layer which is colored orange.

At top, the CFU is shown in a vertexial view.

At middle, four CFUs are arranged so that their larger layers are joined edge to edge as a square showing the intralayer relationship of adjoining CFUs within a crystal.

At bottom, a fifth CFU is joined to each of the four CFUs of the square showing the interlayer relationship of adjoining CFUs the crystal.

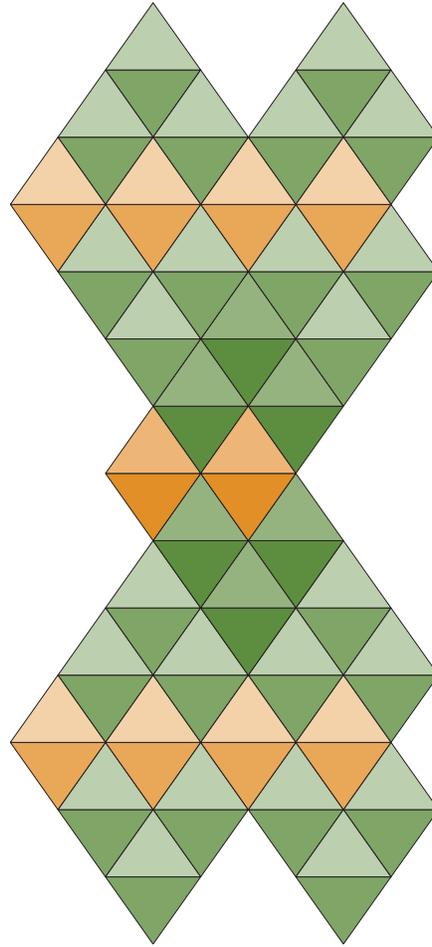


Fig. 8 Semiconductor crystal Type 3B–edgial view
The figure shows the relationship between the CFUs of three adjoining layers of a Type 3B semiconductor crystal.

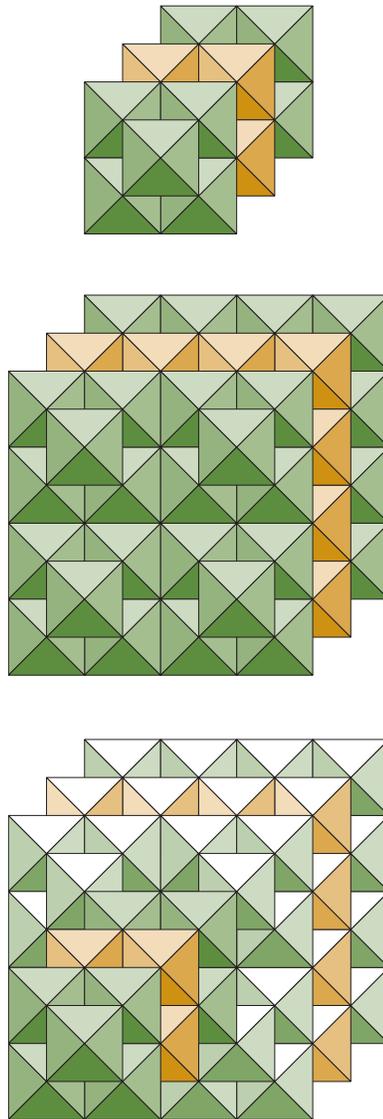


Fig. 9 Semiconductor CFU Type 3C

The Type 3C CFU is formed by two Si-atoms. Each Si-atom contributes two He-octas to the 2-layer which is colored orange.

At top, the CFU is shown in a vertexial view.

At middle, four CFUs are arranged so that their larger layers are joined edge to edge as a square showing the intralayer relationship of adjoining CFUs within a crystal.

At bottom, a fifth CFU is joined to each of the four CFUs of the square showing the interlayer relationship of adjoining CFUs the crystal.

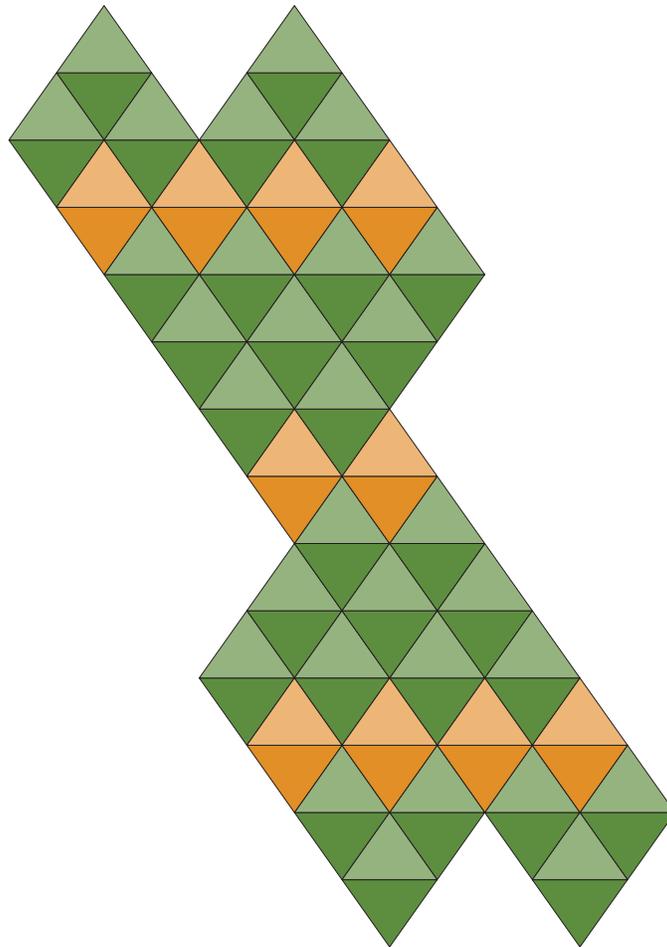


Fig. 10 Semiconductor crystal Type 3C–edgial view
The figure shows the relationship between the CFUs of three adjoining layers of a Type 3C semiconductor crystal.

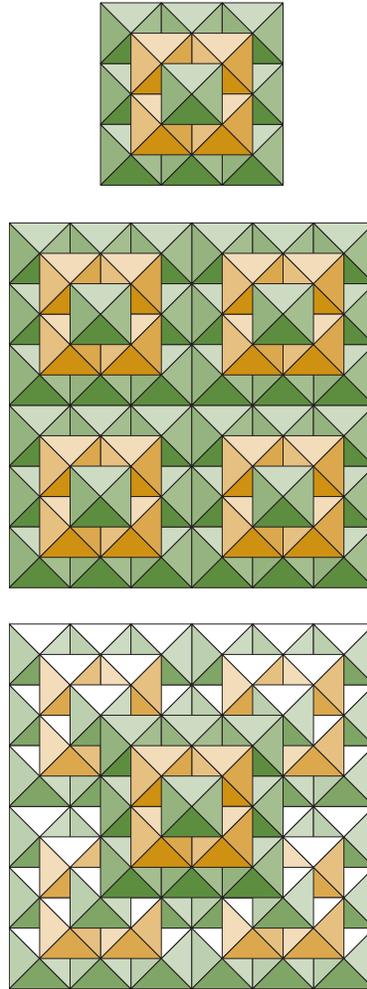


Fig. 11 Semiconductor CFU Type 3D

At top, the Type 3D CFU is shown in a vertexial view. The atomic pairings that produce this CFU are BAs, CGe, GaN, and ZnO. The CFU has the same form as the Sr-atom.

At middle, four CFUs are arranged so that their larger layers are joined edge to edge as a square showing the intralayer relationship of adjoining CFUs within a crystal.

At bottom, a fifth CFU is joined to each of the four CFUs of the square showing the interlayer relationship of adjoining CFUs the crystal.

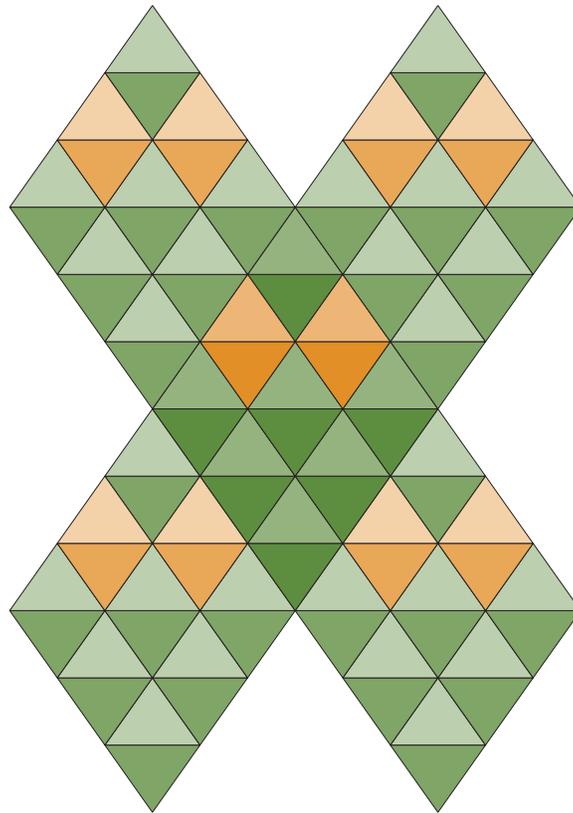


Fig. 12 Semiconductor crystal Type 3D–edgial view
The figure shows the relationship between the CFUs of three adjoining layers of a Type 3D semiconductor crystal.

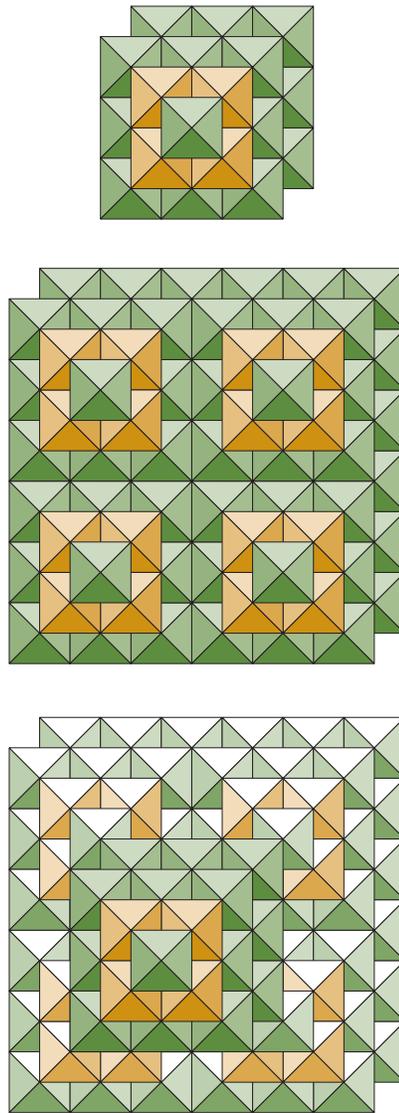


Fig. 13 Semiconductor CFU Type 4A

At top, the Type 4A CFU is shown in a vertexial view. The atomic pairings that produce this CFU are BSb, CdO, CSn, and InN. The CFU has the same form as the Ba-atom.

At middle, four CFUs are arranged so that their larger layers are joined edge to edge as a square showing the intralayer relationship of adjoining CFUs within a crystal.

At bottom, a fifth CFU is joined to each of the four CFUs of the square showing the interlayer relationship of adjoining CFUs the crystal.

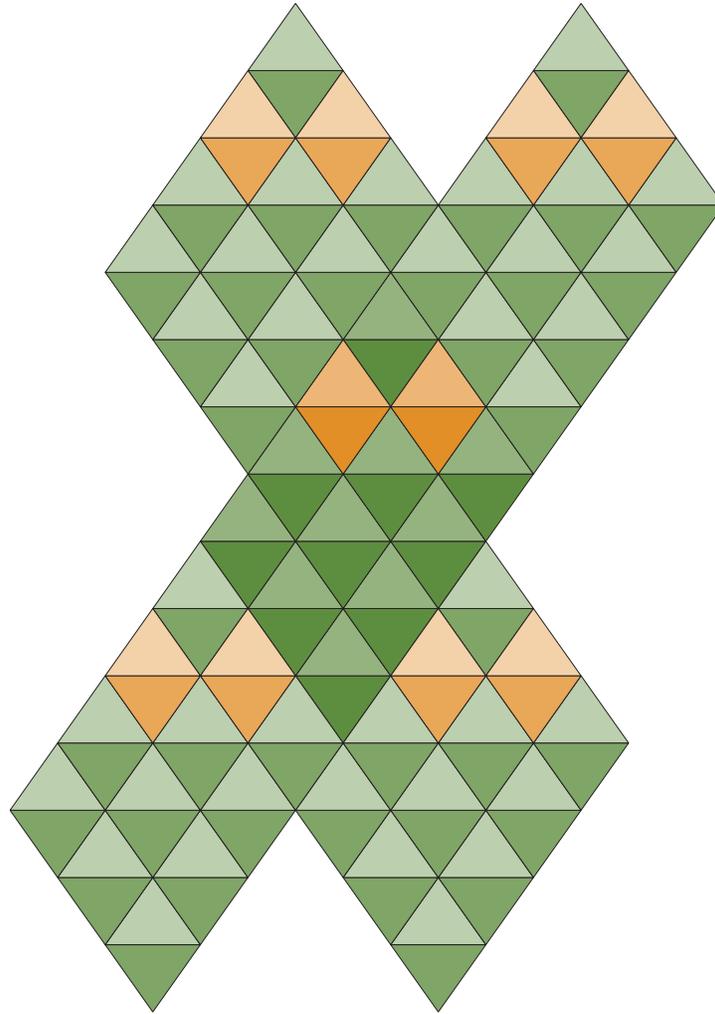


Fig. 14 Semiconductor crystal Type 4A–edgial view

The figure shows the relationship between the CFUs of three adjoining layers of a Type 4A semiconductor crystal.

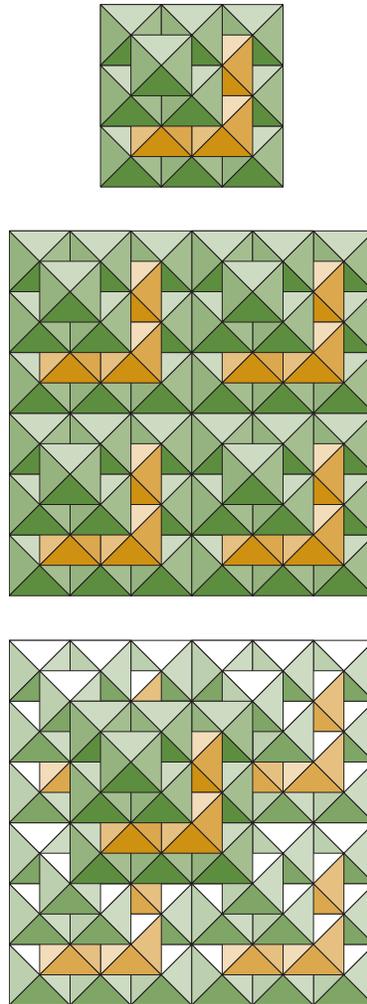


Fig. 15 Semiconductor CFU Type 4B

At top, the Type 4B CFU is shown in a vertexial view. The atomic pairings that produce this CFU are AIAs, SiGe, GaP, and ZnS.

At middle, four CFUs are arranged so that their larger layers are joined edge to edge as a square showing the intralayer relationship of adjoining CFUs within a crystal.

At bottom, a fifth CFU is joined to each of the four CFUs of the square showing the interlayer relationship of adjoining CFUs the crystal.

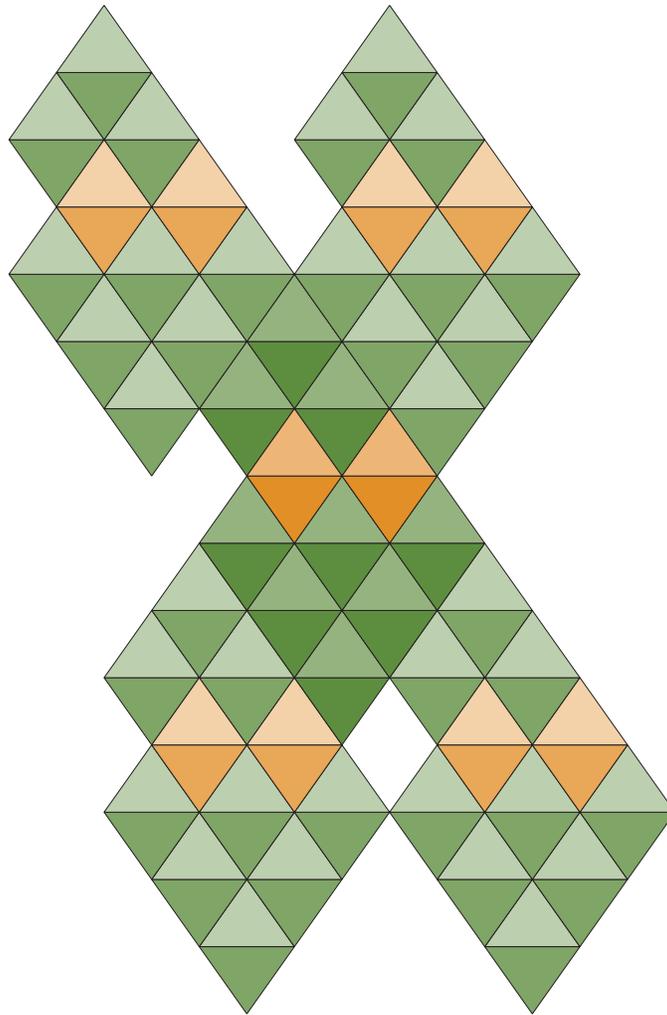


Fig. 16 Semiconductor crystal Type 4B–edgial view
The figure shows the relationship between the CFUs of three adjoining layers of a Type 4B semiconductor crystal.

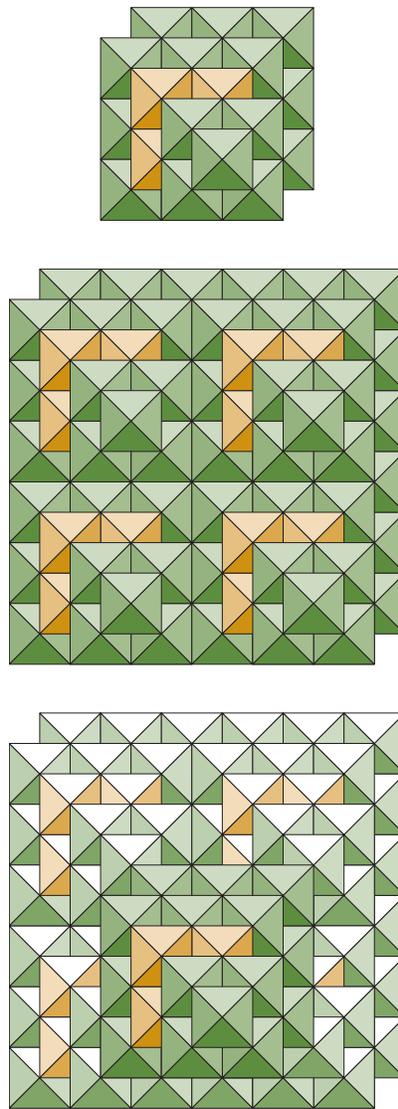


Fig. 17 Semiconductor CFU Type 5A

At top, the Type 5A CFU is shown in a vertexial view. The atomic pairings that produce this CFU are AlSb, CdS, InP, and SiSn

At middle, four CFUs are arranged so that their larger layers are joined edge to edge as a square showing the intralayer relationship of adjoining CFUs within a crystal.

At bottom, a fifth CFU is joined to each of the four CFUs of the square showing the interlayer relationship of adjoining CFUs the crystal.

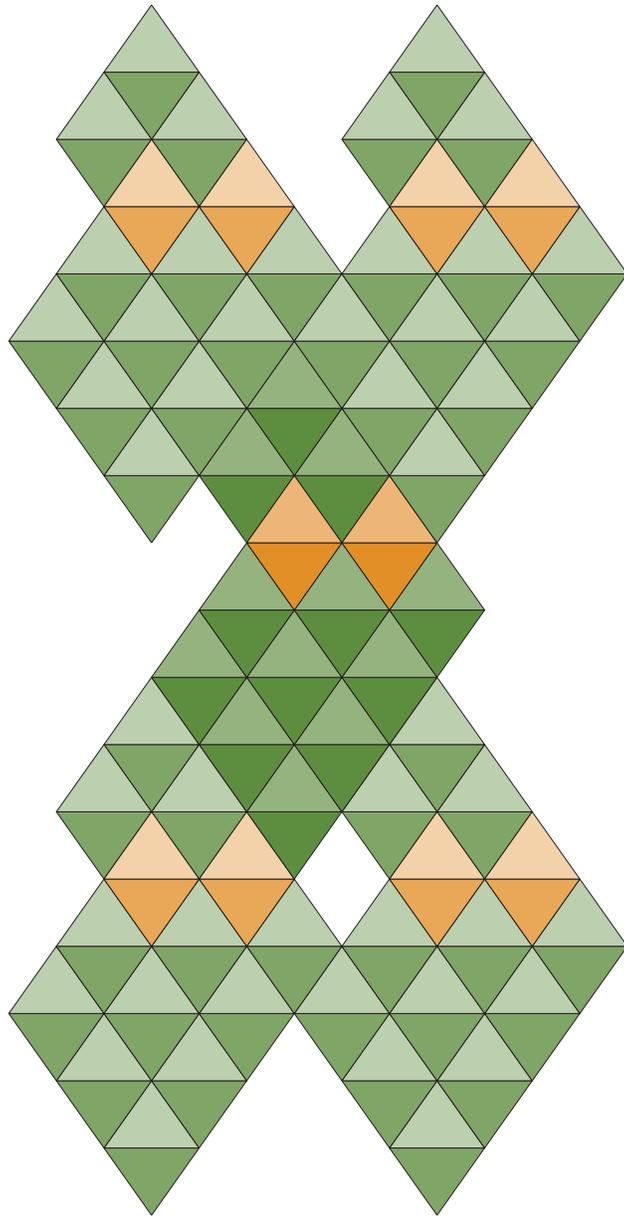


Fig. 18 Semiconductor crystal Type 5A–edgial view
The figure shows the relationship between the CFUs of three adjoining layers of a Type 5A semiconductor crystal.

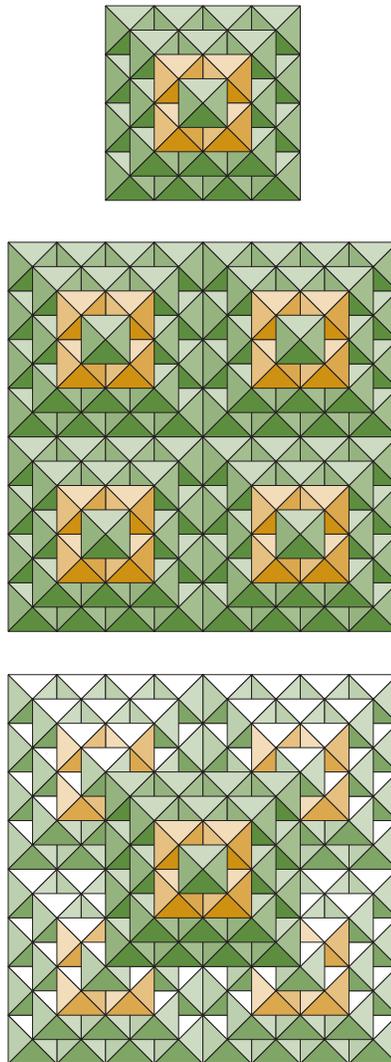


Fig. 19 Semiconductor CFU Type 5B

At top, the Type 5B CFU is shown in a vertexial view. The atomic pairings that produce this CFU are BBi, CPb, HgO, and TIN. The CFU has the same form as the Ra-atom.

At middle, four CFUs are arranged so that their larger layers are joined edge to edge as a square showing the intralayer relationship of adjoining CFUs within a crystal.

At bottom, a fifth CFU is joined to each of the four CFUs of the square showing the interlayer relationship of adjoining CFUs the crystal.

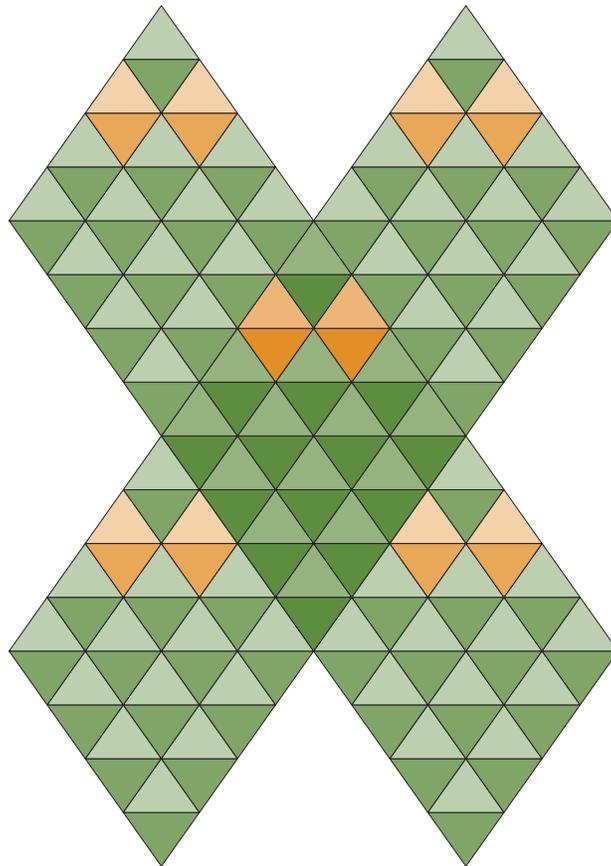


Fig. 20 Semiconductor crystal Type 5B–edgial view

The figure shows the relationship between the CFUs of three adjoining layers of a Type 5B semiconductor crystal.

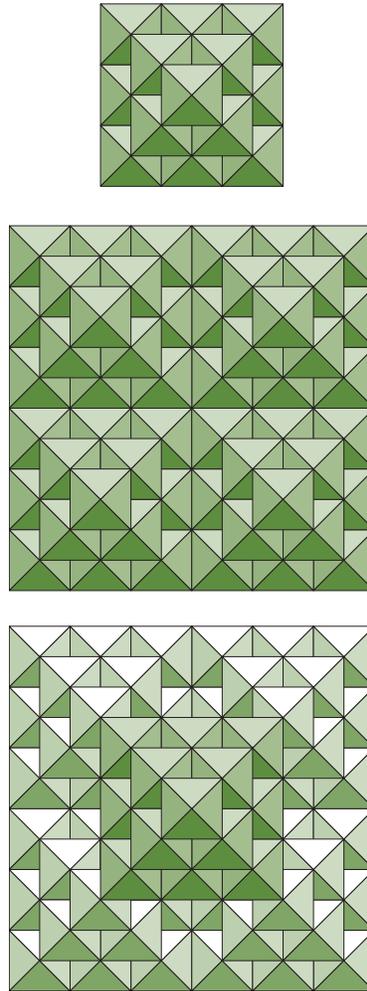


Fig. 21 Semiconductor CFU Type 5C

At top, the Type 5C CFU is shown in a vertexial view. The atomic pairings that produce this CFU are GeGe, ZnSe, and GaAs. The CFU has the same form as the Sr-atom.

At middle, four CFUs are arranged so that their larger layers are joined edge to edge as a square showing the intralayer relationship of adjoining CFUs within a crystal.

At bottom, a fifth CFU is joined to each of the four CFUs of the square showing the interlayer relationship of adjoining CFUs the crystal.

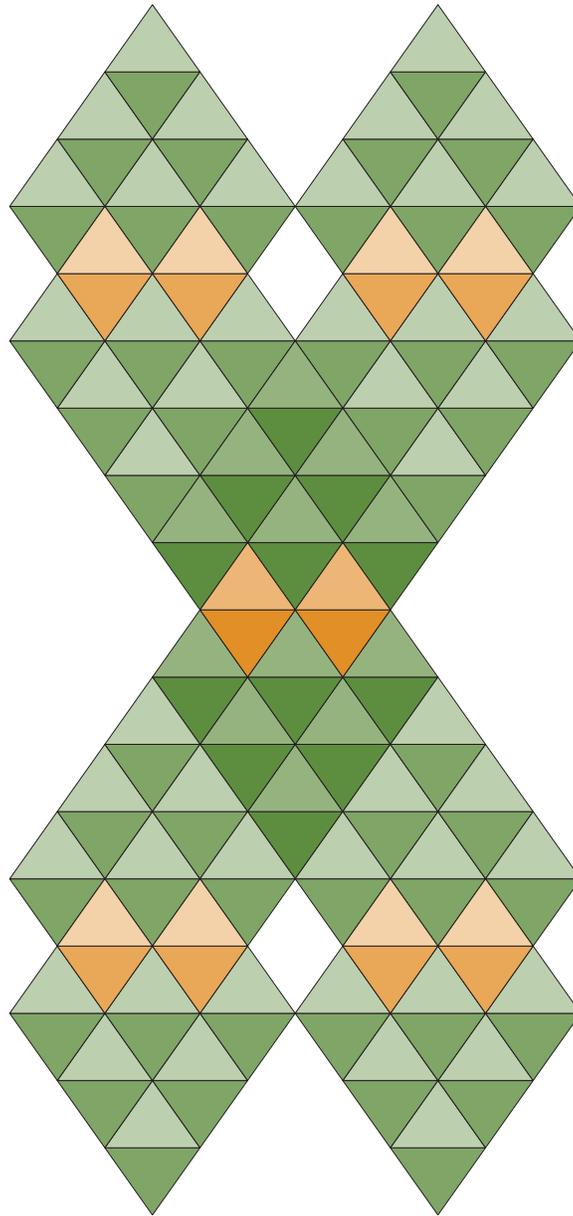


Fig. 22 Semiconductor crystal Type 5C—edgial view
The figure shows the relationship between the CFUs of three adjoining layers of a Type 5C semiconductor crystal.

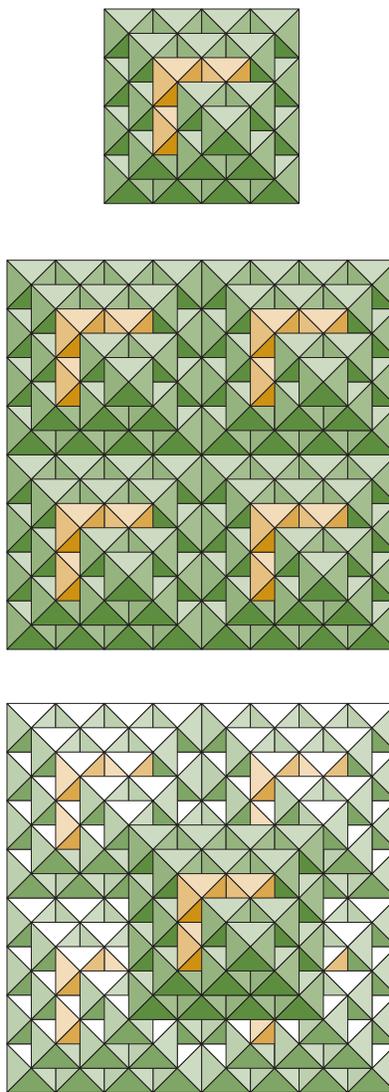


Fig. 23 Semiconductor CFU Type 6A

At top, the Type 6A CFU is shown in a vertexial view. The atomic pairings that produce this CFU are AlBi, HgS, SiPb, and TIP.

At middle, four CFUs are arranged so that their larger layers are joined edge to edge as a square showing the intralayer relationship of adjoining CFUs within a crystal.

At bottom, a fifth CFU is joined to each of the four CFUs of the square showing the interlayer relationship of adjoining CFUs the crystal.

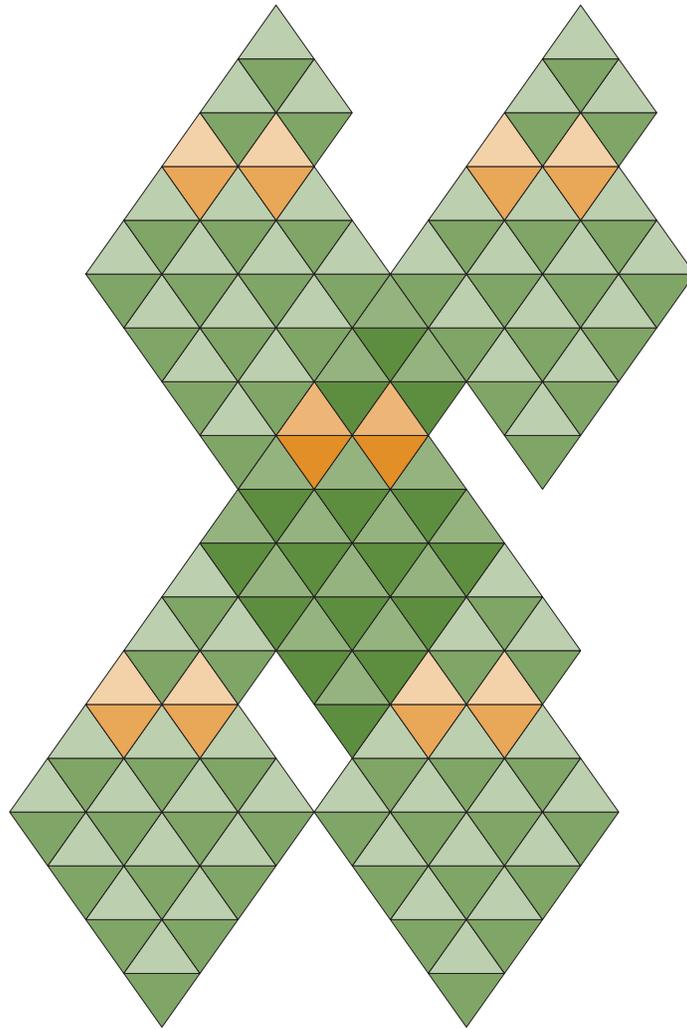


Fig. 24 Semiconductor crystal Type 6A—edgial view
The figure shows the relationship between the CFUs of three adjoining layers of a Type 6A semiconductor crystal.

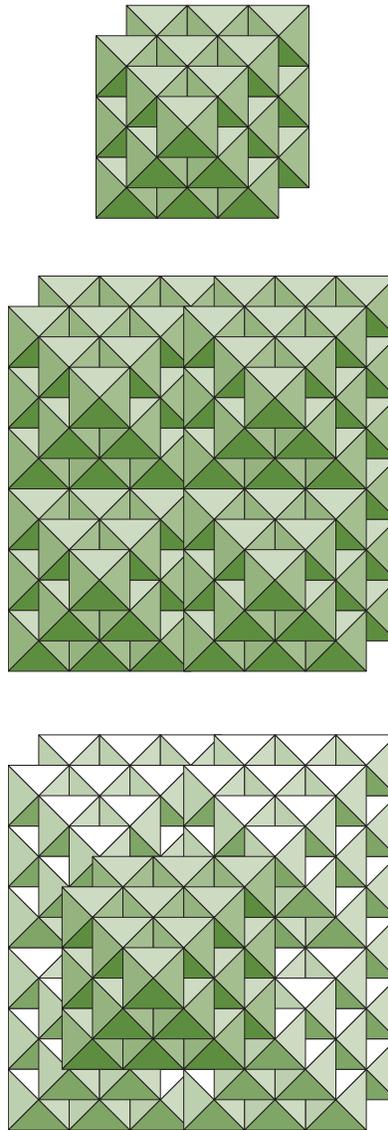


Fig. 25 Semiconductor CFU Type 6B

At top, the Type 6B CFU is shown in a vertexial view. The atomic pairings that produce this CFU are CdSe, GeSn, ZnTe, GaSb, and InAs.

At middle, four CFUs are arranged so that their larger layers are joined edge to edge as a square showing the intralayer relationship of adjoining CFUs within a crystal.

At bottom, a fifth CFU is joined to each of the four CFUs of the square showing the interlayer relationship of adjoining CFUs the crystal.

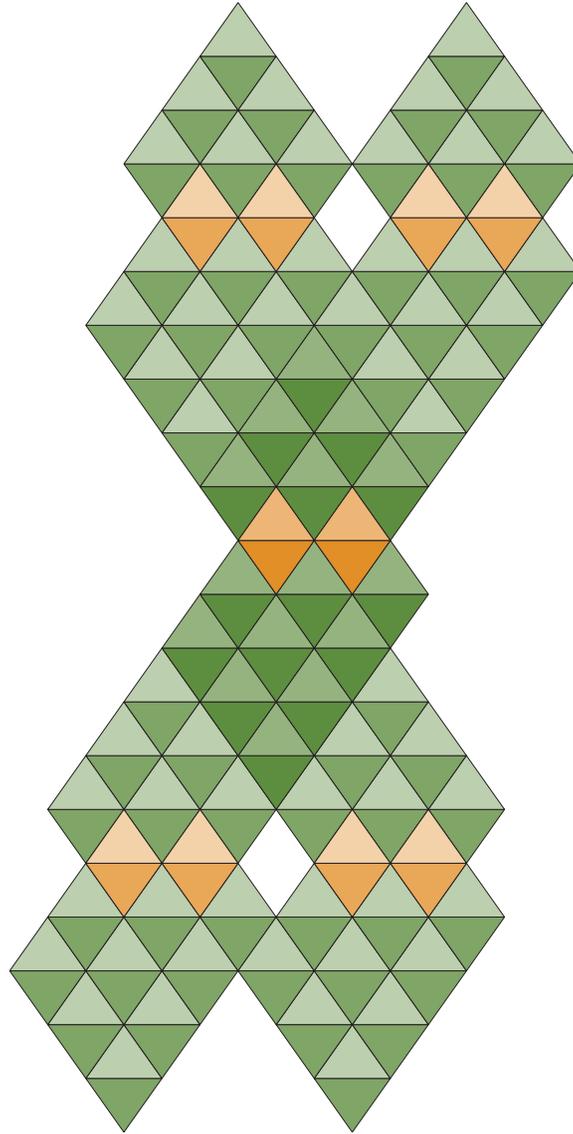


Fig. 26 Semiconductor crystal Type 6B–edgial view
The figure shows the relationship between the CFUs of three adjoining layers of a Type 6B semiconductor crystal.

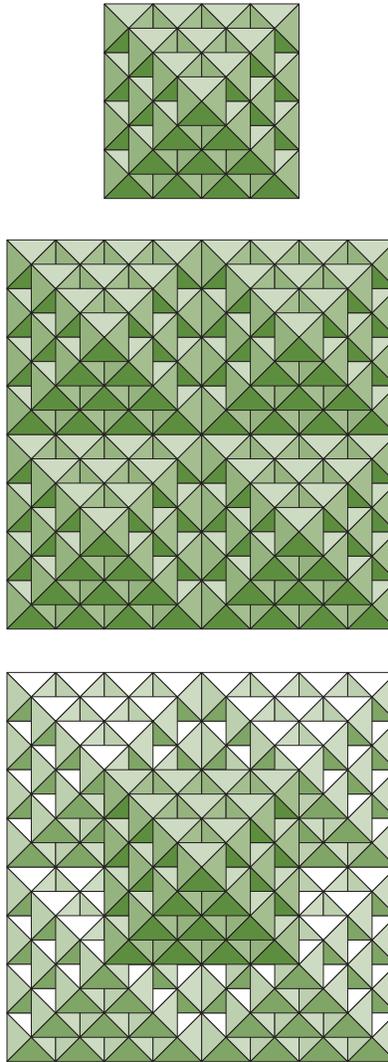


Fig. 27 Semiconductor CFU Type 7A

At top, the Type 7A CFU is shown in a vertexial view. The atomic pairings that produce this CFU are HgSe, ZnPo, GaBi, TlAs, and GePb.

At middle, four CFUs are arranged so that their larger layers are joined edge to edge as a square showing the intralayer relationship of adjoining CFUs within a crystal.

At bottom, a fifth CFU is joined to each of the four CFUs of the square showing the interlayer relationship of adjoining CFUs the crystal.

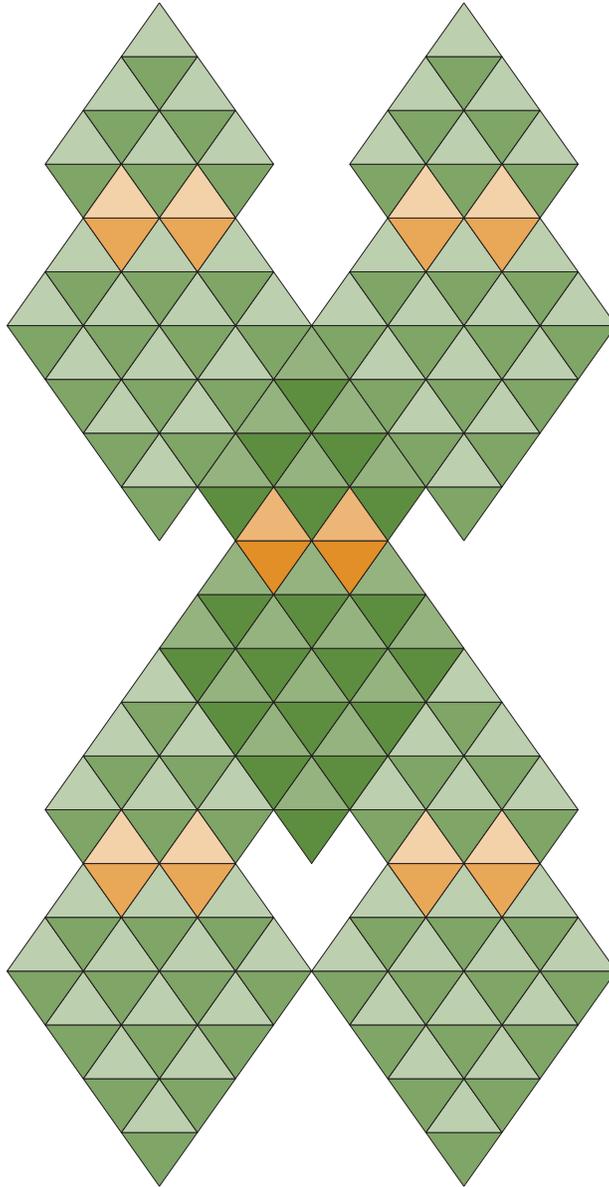


Fig. 28 Semiconductor crystal Type 7A—edgial view
The figure shows the relationship between the CFUs of three adjoining layers of a Type 7A semiconductor crystal.

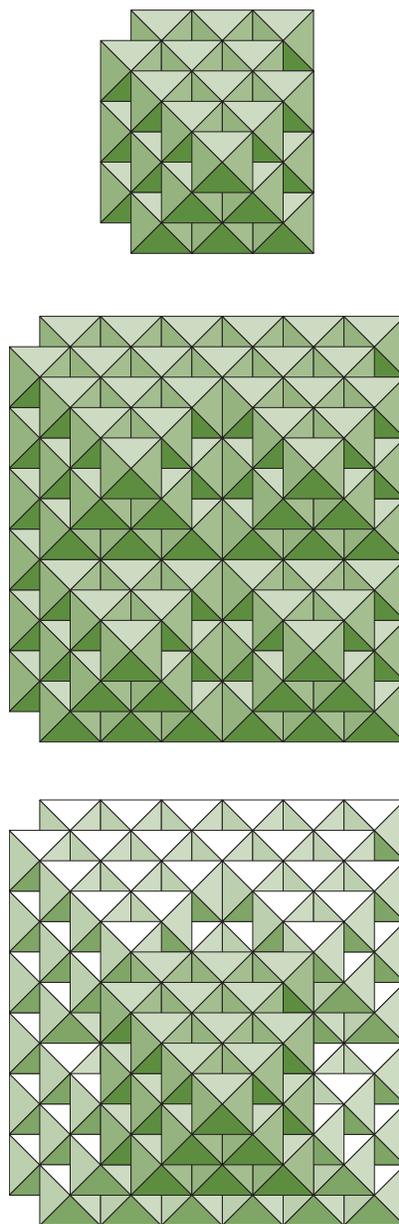


Fig. 29 Semiconductor CFU Type 7B

At top, the Type 7B CFU is shown in a vertexial view. The atomic pairings that produce this CFU are CdTe, SnSn, and InSb.

At middle, four CFUs are arranged so that their larger layers are joined edge to edge as a square showing the intralayer relationship of adjoining CFUs within a crystal.

At bottom, a fifth CFU is joined to each of the four CFUs of the square showing the interlayer relationship of adjoining CFUs the crystal.

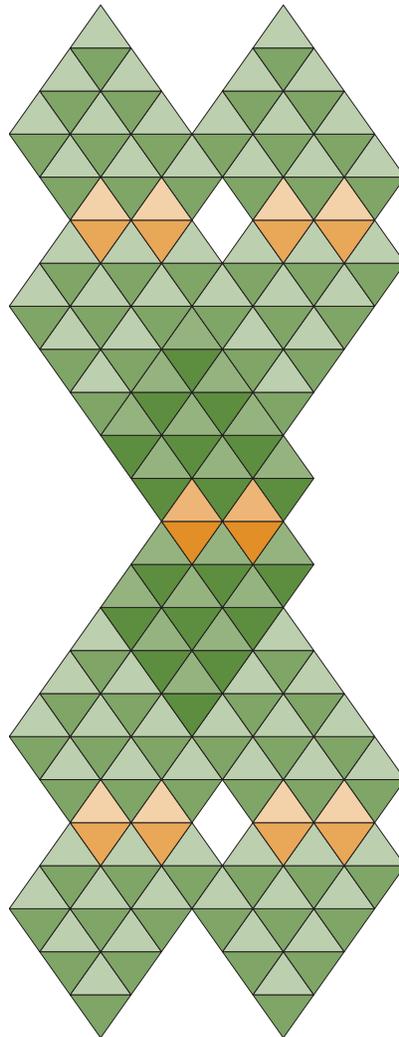


Fig. 30 Semiconductor crystal Type 7B—edgial view
The figure shows the relationship between the CFUs of three adjoining layers of a Type 7B semiconductor crystal.

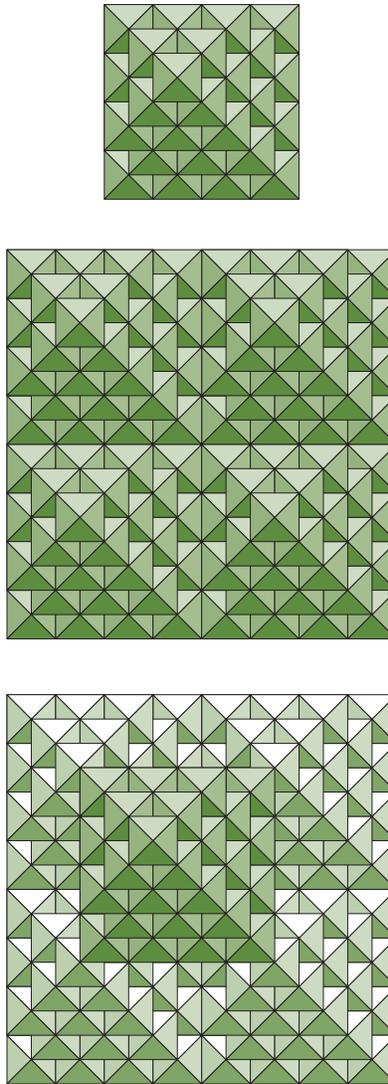


Fig. 31 Semiconductor CFU Type 8

At top, the Type 8 CFU is shown in a vertexial view. The atomic pairings that produce this CFU are CdPo, HgTe, PbSn, InBi, and TlSb.

At middle, four CFUs are arranged so that their larger layers are joined edge to edge as a square showing the intralayer relationship of adjoining CFUs within a crystal.

At bottom, a fifth CFU is joined to each of the four CFUs of the square showing the interlayer relationship of adjoining CFUs the crystal.

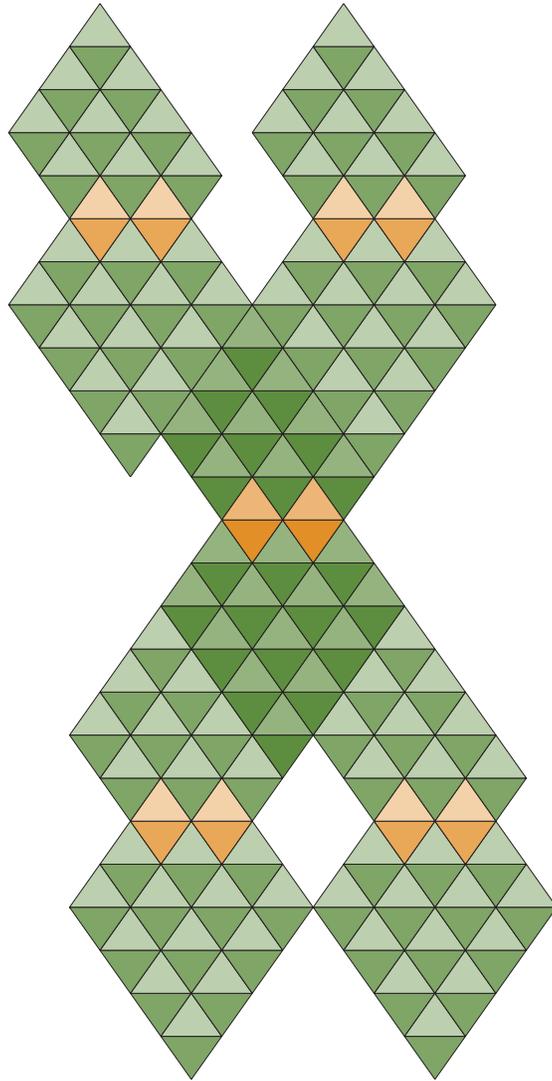


Fig. 32 Semiconductor crystal Type 8–edgial view
The figure shows the relationship between the CFUs of three adjoining layers of a Type 8 semiconductor crystal.

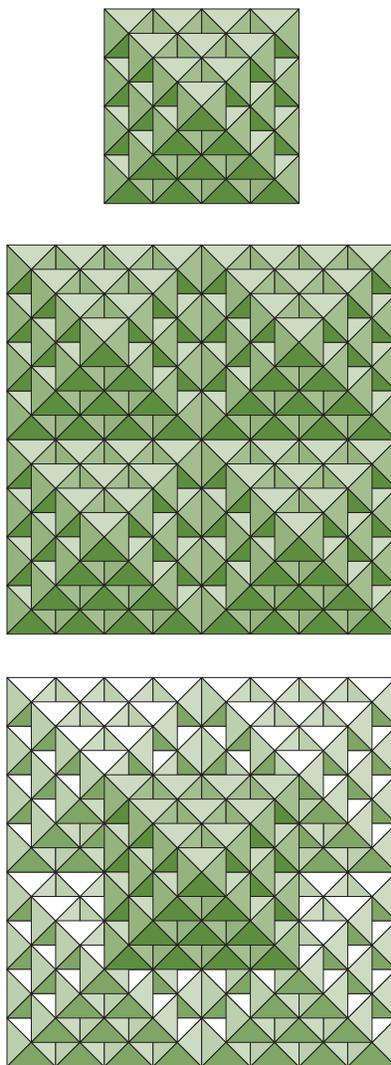


Fig. 33 Semiconductor CFU Type 9

At top, the Type 9 CFU is shown in a vertexial view. The atomic pairings that produce this CFU are BiTl, HgPo, and PbPb.

At middle, four CFUs are arranged so that their larger layers are joined edge to edge as a square showing the intralayer relationship of adjoining CFUs within a crystal.

At bottom, a fifth CFU is joined to each of the four CFUs of the square showing the interlayer relationship of adjoining CFUs the crystal.

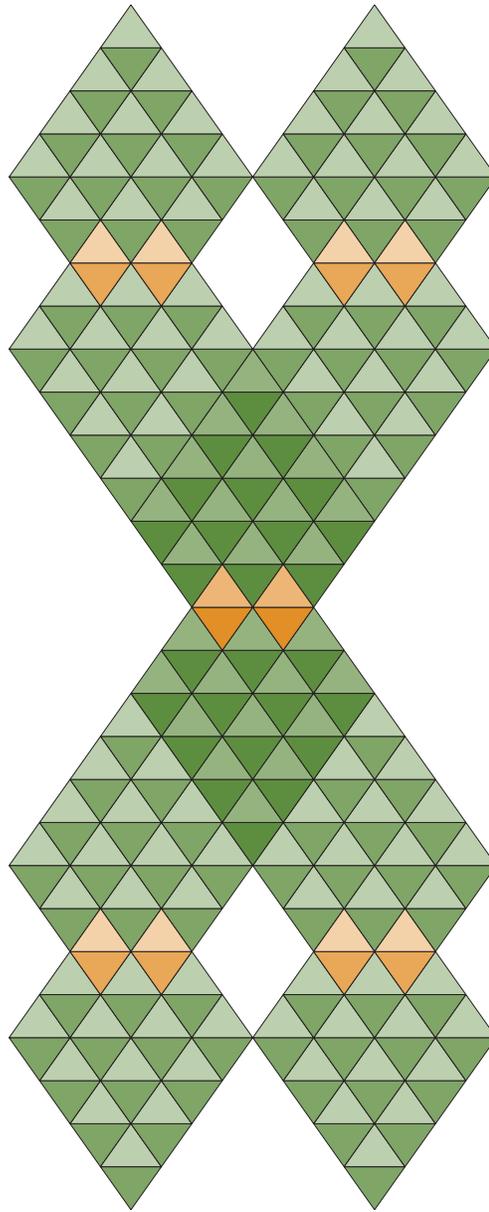


Fig. 34 Semiconductor crystal Type 9—edgial view
The figure shows the relationship between the CFUs of three adjoining layers of a Type 9 semiconductor crystal.

