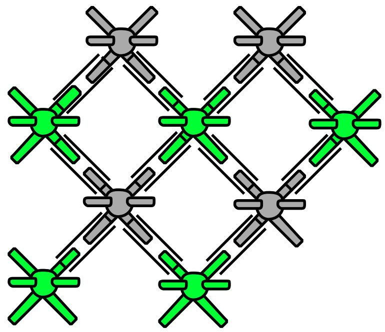
Super Models



Cesium Chloride
Crystal Lattice Model

Recommended for ages 10 – adult.

Caution: Atom centers and vinyl tubing are a choking hazard. Do not eat or chew model parts.

Kit Contents:

26 silver 8-peg cesium atom centers (1 spare)
28 green 8-peg chloride atom centers (1 spare)
2 black beads (1 spare)
97 clear, 1.25″ bonds (2 spares)

Phone: 806-438-6865
E-mail: etishler@rylerenterprises.com
Website: www.rylerenterprises.com
Address: 5701 1st Street, Lubbock, TX 79416

Related Kits Available:
Wurtzite (ZnS)
Zinc Blende (ZnS)
Fluorite (CaF_2)
Sodium Chloride (NaCl)

General Information

The main source of cesium chloride is the mineral pollucite where it is colorless, but when it is ground into a powder, it appears white. Not very much of the salt is mined in any year.

The cesium chloride crystal is a good example of a simple cubic lattice composed of alternating positive cesium ions (cations) and negative chloride ions (anions). Each cesium ion is surrounded by eight chloride ions, and each chloride ion is surrounded by eight cesium ions within the crystal. This arrangement is called a coordination number (CN). Thus, this salt has a cation CN of eight and an anion CN of eight.

Cesium chloride is very hygroscopic, meaning the salt can dissolve itself quite easily by absorbing water from the atmosphere.

There are a number of limited uses of the salt. An obvious one is using it for the extraction of the metal cesium. Cesium chloride is used in medical practice to treat some cancers, in some diagnostic procedures, and in experimental biology. Some industrial processes such as soldering and welding, manufacturing beer and mineral water, and oil extraction also utilize the salt.

Cesium Chloride Assembly Instructions

1. Connect green chloride ions to silver cesium ions to from a flat layer with eight ions total. Place a black bead on a cesium ion as shown (this is done to make the identification of layer 1 easier). (Fig. 1)

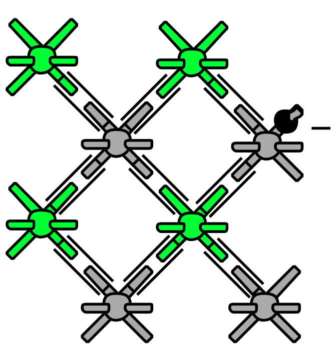


Fig. 1 Layer 1 of model.

2. Repeat step 1 one more time to form layer 3, but this time do not add a black bead.

3. Construct layers 2 and 4 as shown in Fig. 2.

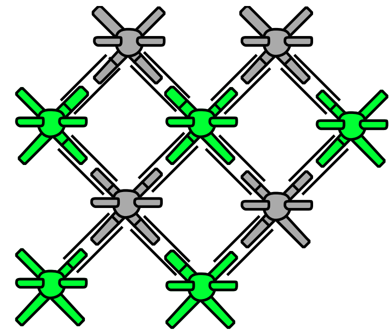


Fig. 2 Layers 2 and 4 of model.

4. Connect layer 2 to layer 1 so that the cesium and chloride ions alternate in position. For clarity of illustration, bonds have been removed from layer 2 which is below layer 1 in Fig. 3.

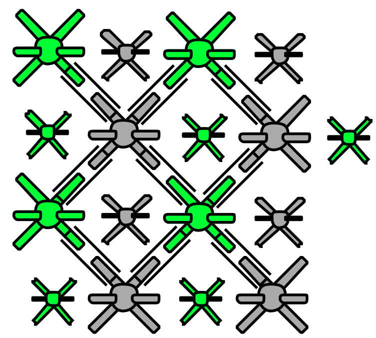


Fig. 3 Layer 2 below layer 1.

5. Now connect layers 3 to 2 and 4 to 3 making sure that the first layer is in register with the third layer, and the second layer is in line with the fourth layer.

6. Each ion in a crystal is surrounded by several ions of opposite charge. The number of surrounding ions is the coordination number (CN). Bond one cesium with eight chlorides to form a separate model to show the cation CN of eight. (Fig. 4)

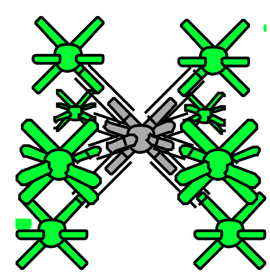


Fig. 4 Cation coordination number 8.

7. Bond one chloride with eight sodium ions to form a separate model to show the anion CN of eight. (Fig. 5)

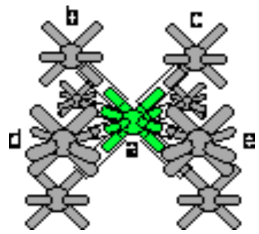


Fig. 5 Anion coordination number 8.

8. The unit cell (basic building block) of a cesium chloride crystal is a simple cube. This shape can be observed in the model of the anion CN by holding the structure as in Fig. 5. Next rotate the model 45° toward you. The model will now look like Fig. 6. Notice that the four cesium ions and the chloride ion have been labeled in Fig. 5 to aid in the tracking of their positions. b and c are the upper, front corners of a cube. d and e are at the lower, front. The repositioned model should look like Fig. 6.

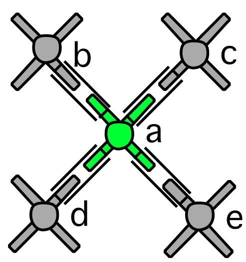


Fig. 6 Front side of CsCl unit cell.

It is important to note that a unit cell is determined by looking for the positions of like ions only. Therefore, in CsCl, when observing a unit cell of cesium ions, we ignore the chloride and vice-versa.

Fig. 7 depicts a three dimensional view of the unit cell of cesium chloride.

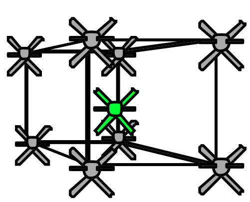


Fig. 7 CsCl unit cell in three dimensions.

9. In order to observe the unit cell in the crystal model, turn it to coincide with Fig. 8. Look for the chloride ion labeled a, which will have the same relationship to a simple cubic unit cell as the chloride ion in Fig. 6.

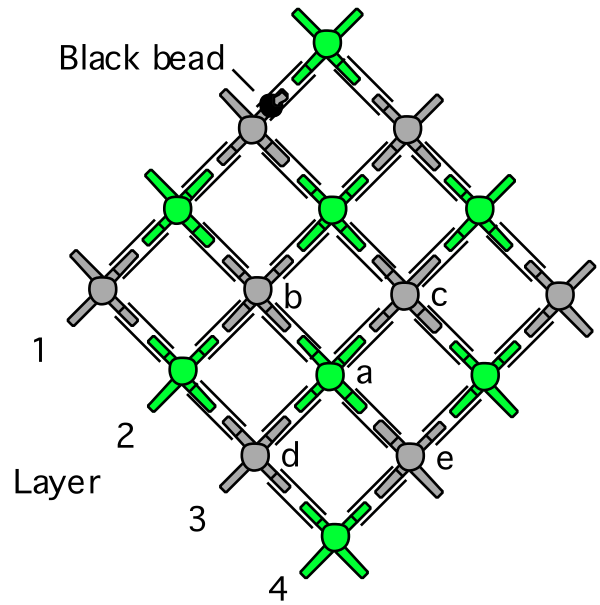


Fig. 8 Side view of CsCl showing front of unit cell.

10. Now look for a unit cell of chloride ions.