

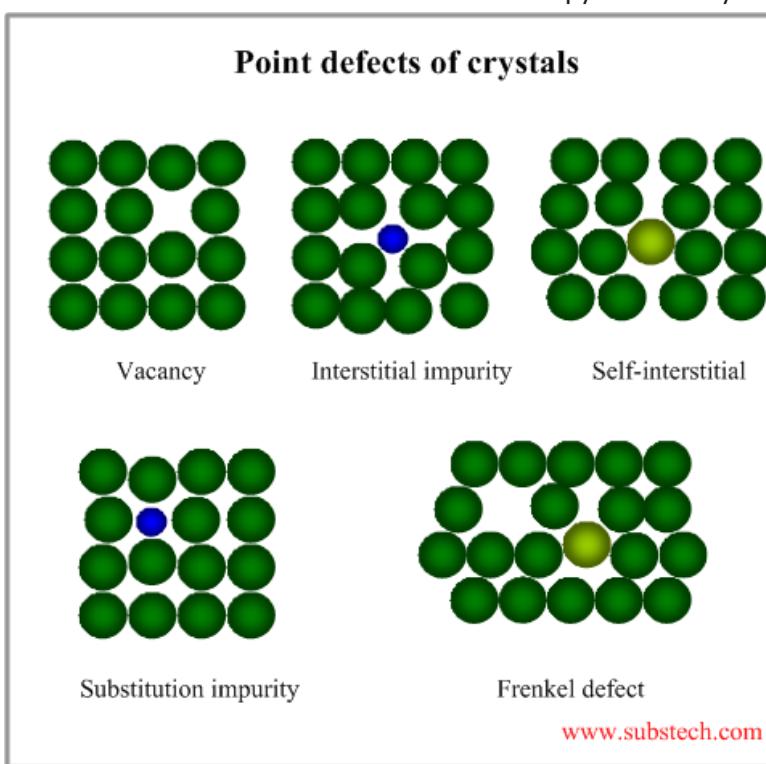
## Question #54031, Physics / Solid State Physics |

Explain the three types of defects in crystals

**Answer:**

There are three types of defects in crystals:

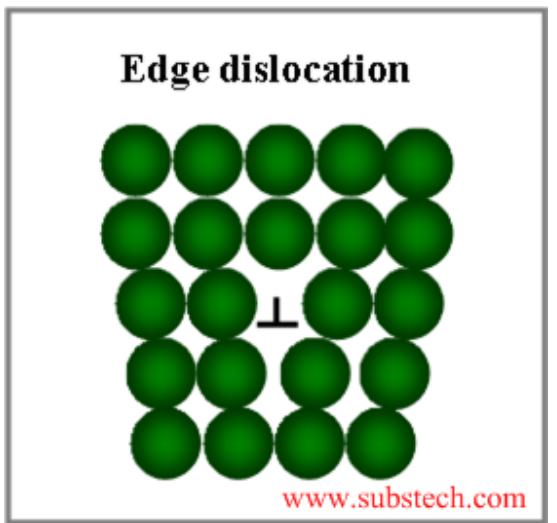
- 1) The point defects:
  - a) Vacancies or so-called Schottki defects are the appearance of lattice sites without atoms or ions that leads to deformation of the lattice.
  - b) Self-interstitialcy is formed when atom occupies a position in the lattice where no atom would ordinary appear.
  - c) Frenkel pair is caused by the removing of atom from regular position to interstitial site to produce one vacancy and one interstitialcy.
  - d) Substitutional defects (Interstitial and Substitution impurities) concern the foreign atoms which substitute the atoms in the lattice or occupy the interlayer sites.



Taken from:

[http://www.substech.com/dokuwiki/doku.php?id=imperfections\\_of\\_crystal\\_structure](http://www.substech.com/dokuwiki/doku.php?id=imperfections_of_crystal_structure)

- 2) The line defects:
  - a) Edge dislocation can be described as the break of one of atomic layers in the crystal.



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b) Screw dislocation is produced when layers are shifted parallelly with respect to other layers as shown in the picture below:

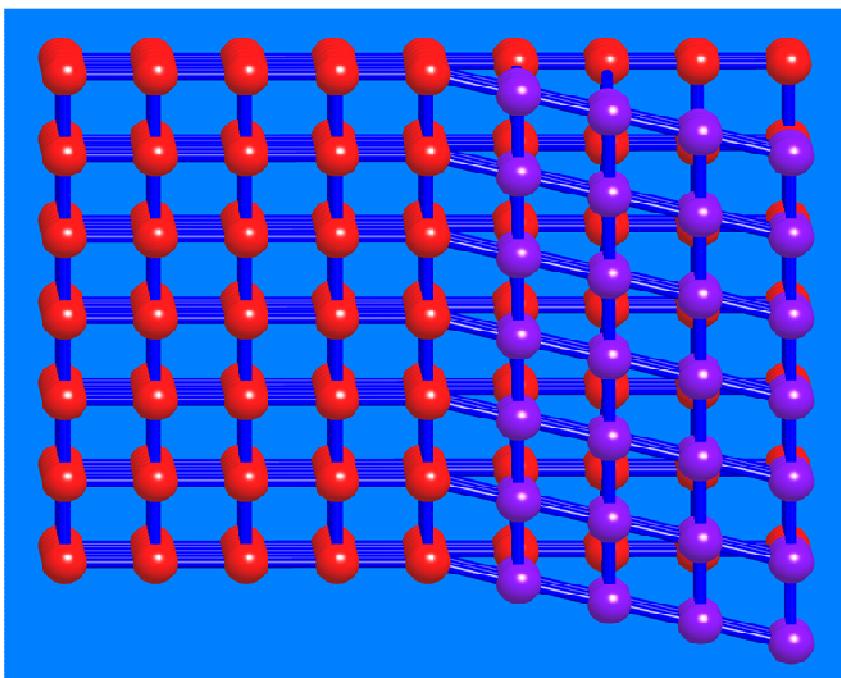
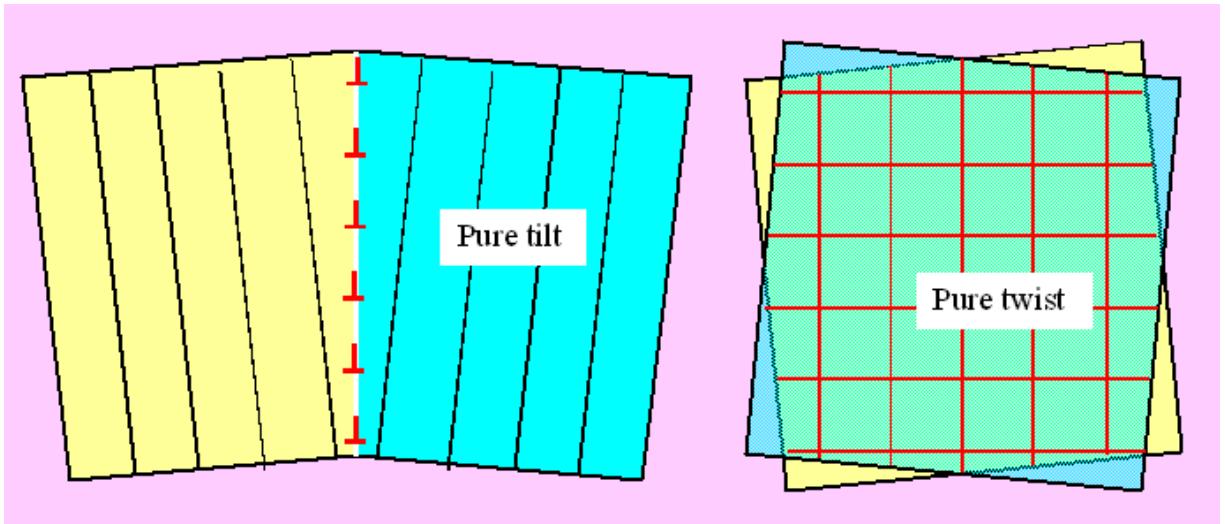


Figure taken from: <http://www.crystalsoftcorp.com/gallery.php>

Video presentation gives better understanding of this defect:  
<https://www.youtube.com/watch?v=TxJOP3hA6To>

3) Two dimensional defects are

- a) tilt boundary – the boundary between two crystals which have different orientation. It contains several edge dislocation (marked in red);
- b) twist boundary is represented by two part of the crystal which are twisted with respect to each other. It has several screw dislocations.



It should be noted that, in the real crystal, 'pure' defects (belonging to one type) are not observed, however, they are present as combination of different types of defects.

More detail information can be found here:

<http://www.mse.berkeley.edu/groups/morris/MSE205/Extras/defects.pdf>

<http://www.AssignmentExpert.com/>