

Crystallography

What is a **crystal**?

Complex description : A piece of a homogeneous solid substance having a natural geometrically regular form with symmetrically arranged plane faces.

Easier : A solid where atoms are ordered in space

What is a unit cell?

A crystal building block – consisting of more than 1 Atom/molecule

What does the term packing ratio mean?

Ratio of atom volume/ Unit Cell volume

What material property does packing ratio affect

Density

Chemistry



What are the 4 main types of atomic bonding?

Answer:

1. **Ionic (Salt)**
2. **Covalent (Rubber)**
3. **Metallic (Salt)**
4. **Covalent with polar molecules giving rise to van de waals forces (water)**

Can you explain the relationships between bond type and material properties?

Answer – Broadly Metallic bonds are strong leading to. Ionic bonds less so but melting points are still very high. Covalent bonds form molecules which can be large or small. The properties depend on the structure of these molecules.

In all cases the properties also depend on crystallography and micro structure.

Electro negativity

What dictates the type of bonds which will form in substances?

Functional Requirements



Can you list the requirements of a product in plain English-
Can you then Quantify those requirements?

Why is quantification good?... :

Answer – because it simplifies verification and
improves your ability to compare ideas and
evaluate tradeoffs

Can you synthesize material requirements from functional
requirements? How do you quantify material requirements?

Answer – use material properties

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Material Properties



Do you know the groups of material properties ?

Answer:

1. **mechanical,**
2. **electrical,**
3. **thermal,**
4. **magnetic,**
5. **optical,**
6. **deteriorative.**

What mechanical properties do you know about?

Answer:

1. **UTS**
2. **Yield strength**
3. **Fatigue Strength**
4. **Toughness**
5. **Creep**
6. **Ductility**
7. **Density**

How do you measure and report each of these? What are the units?

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