Using Marshmallows to Build an Understanding of Materials Science

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What is Materials Science?

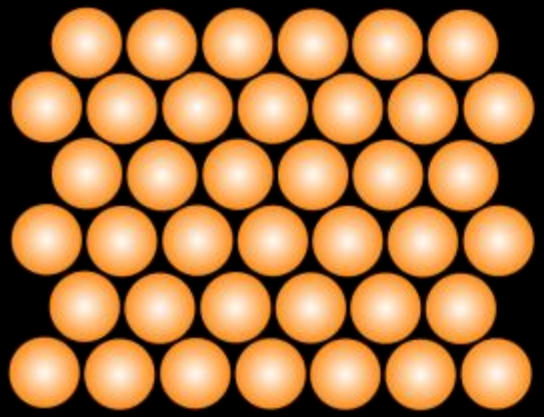
- Study of structure, properties, and processing of materials

- Widely applicable

What kinds of materials are out there?

- Metals
- Ceramics
- Polymers
- Composites

Which is stronger?

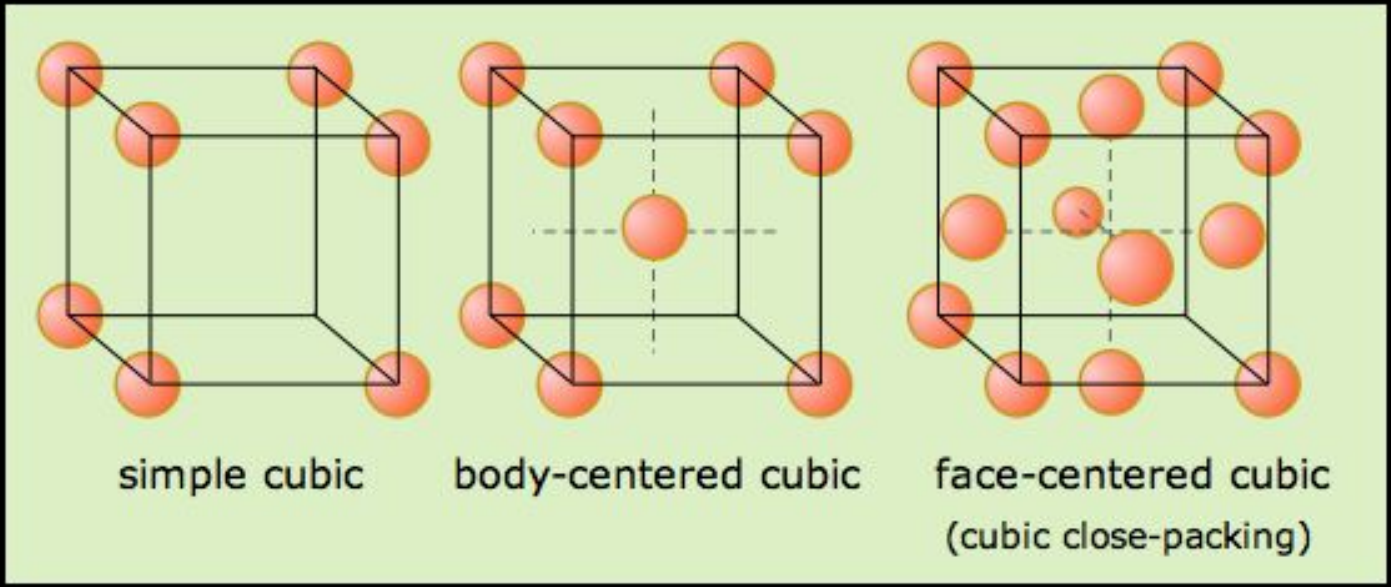


Which of these are crystalline?

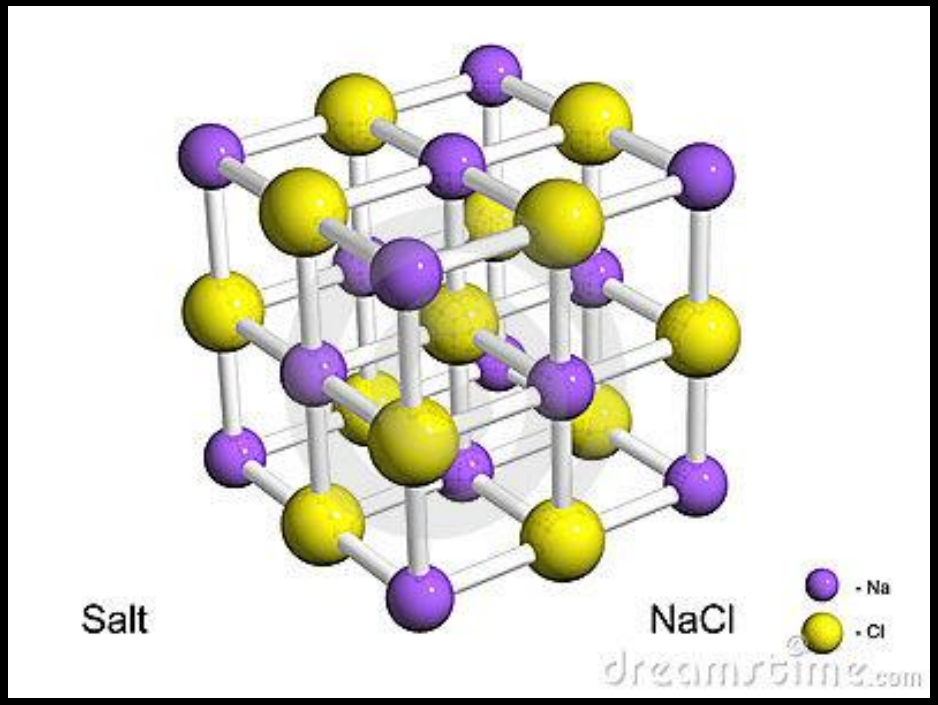
- Metals
- Ceramics
- Polymers
- Composites

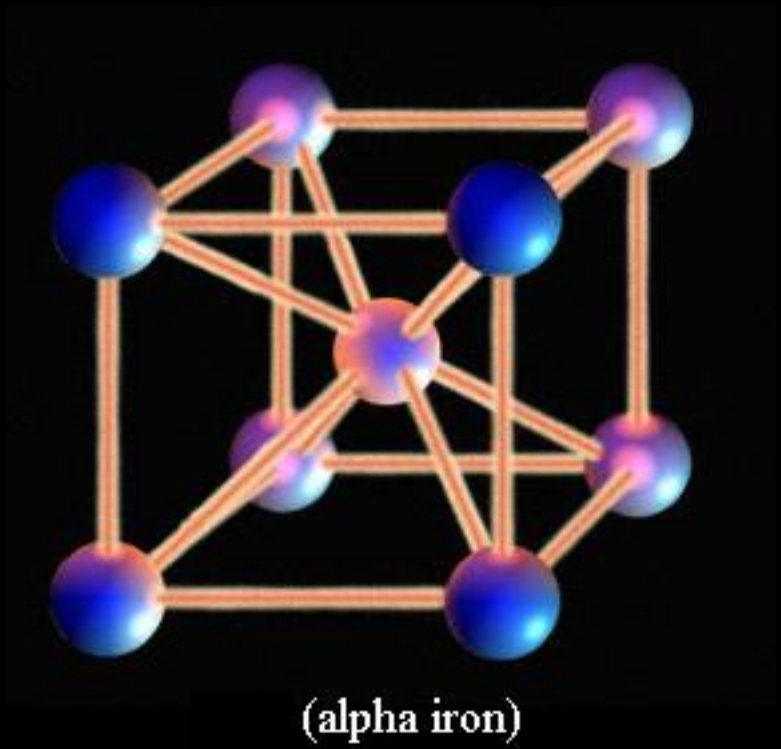
Cubic Structures

- Simple Cubic
- Body-centered Cubic (BCC)
- Face-centered Cubic (FCC)



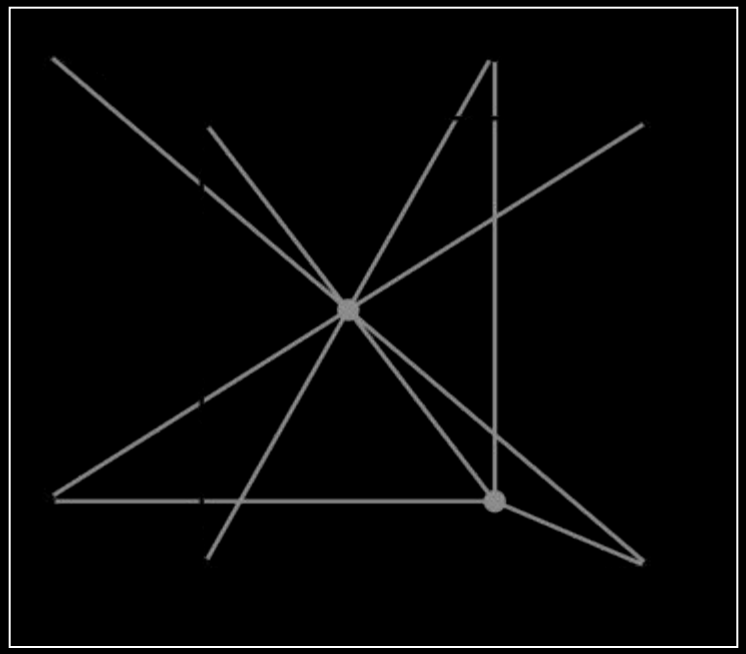
Some Examples



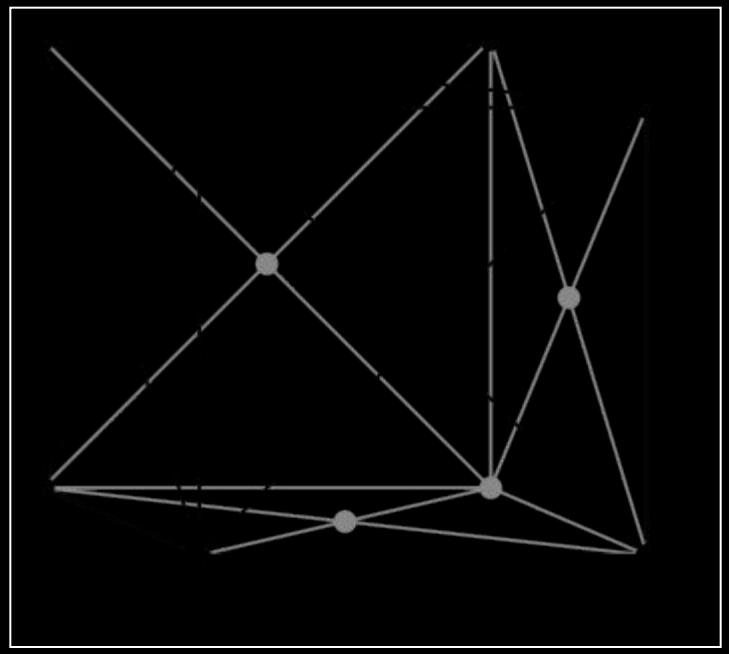

(alpha iron)

Build your own!

- What are some differences between the two structures?



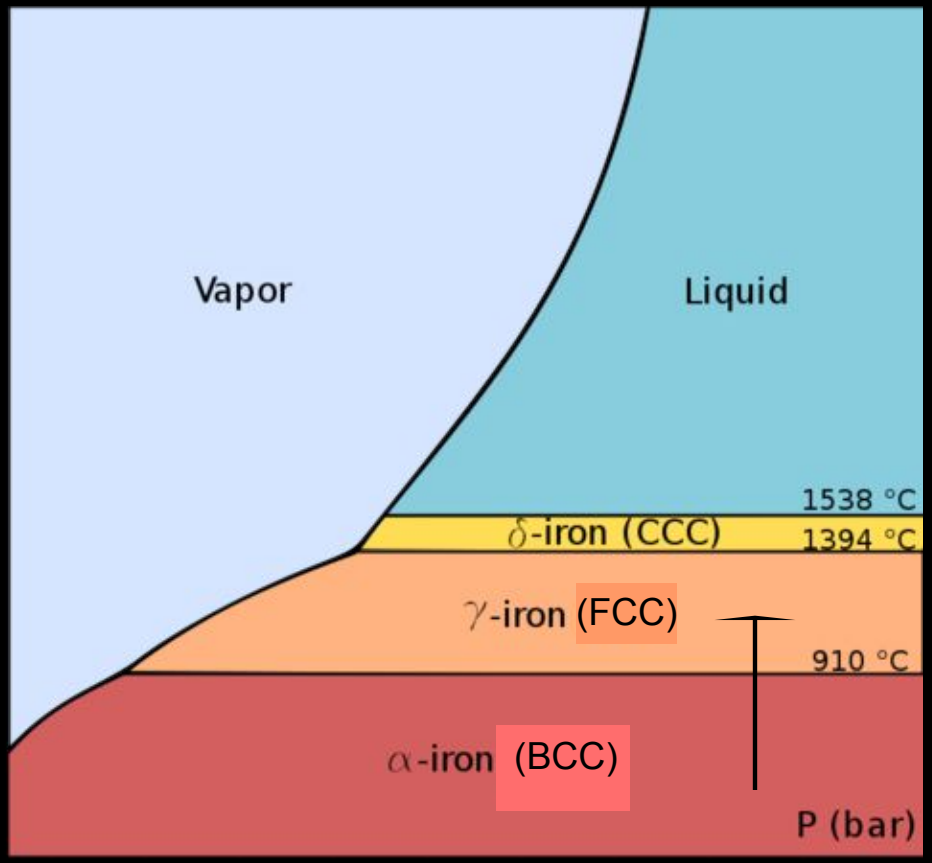
BCC

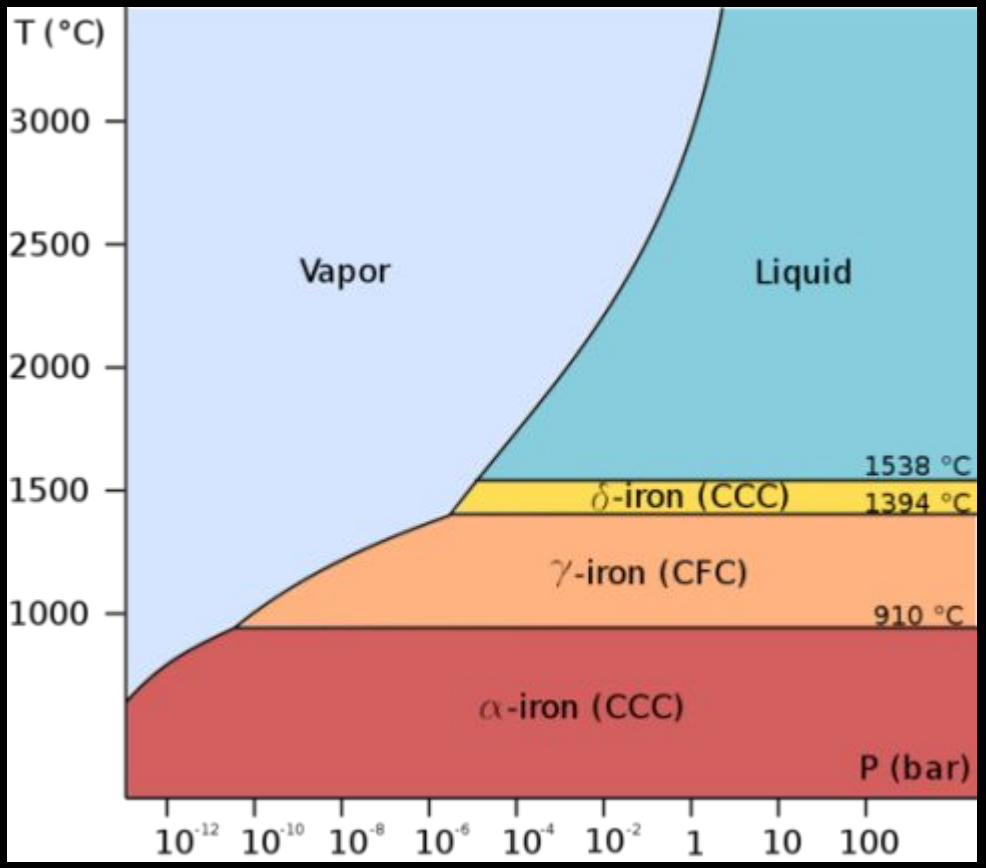


FCC

Case Study: Iron

- Change from BCC to FCC structure occurs at 910 ^{o}C.





– BCC: a = 2.89Å, ρ = 7.62 g/cm^3.
– FCC: a = 3.64Å, ρ = 7.69 g/cm^3 → stronger

Thank you!

- http://www.mrs.org/science-as-art/