

Physical Properties of Minerals

*Color, shape, density,
hardness, etc*

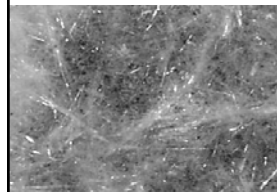
*Each mineral species has
unique and identifiable
physical properties.*

- *Form and habit (Shape)*
- *Luster*
- *Color and Streak*
- *Cleavage and Fracture*
- *Hardness*
- *Density*
- *Tenacity*

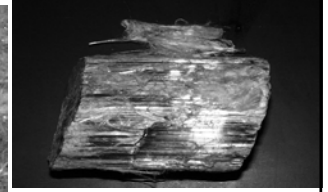
Form and Habit Terms (Crystal Growth Forms)

- *Prismatic (well developed prism faces)*
- *Columnar (Irregular prism faces)*
- *Acicular (needle-like)*
- *Botryoidal (rounded growth surface)*
- *Tabular (Platey)*
- *Stellate (Radiating)*
- *Fibrous (fibers, asbestiform)*
- *Dendritic (tree-like)*

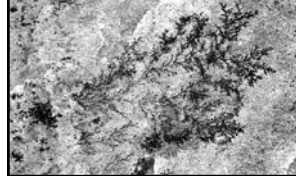
Acicular



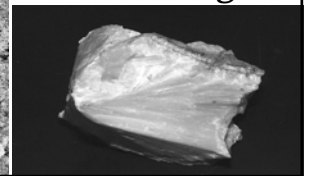
Fibrous



Dendritic



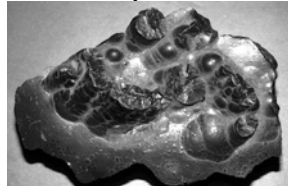
Radiating



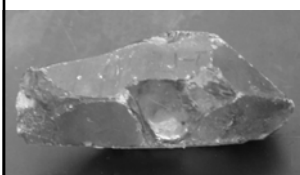
Bladed



Botryoidal



Prismatic

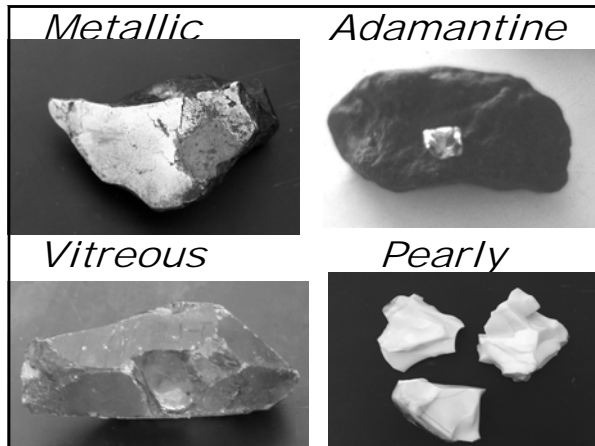


Radiating



Luster and Transparency

- *Luster*
 - *Metallic*
 - *Resinous (waxy)*
 - *Pearly*
 - *Greasy*
 - *Adamantine*
 - *Vitreous*
- *Transparency*
 - *Opaque*
 - *Translucent*
 - *Transparent*



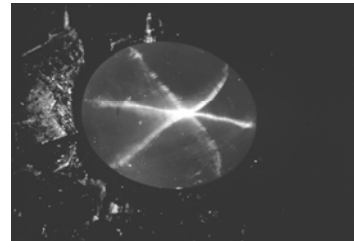
Color and Streak

- *The reflectance color of minerals is strongly affected by transition metals (V, Cr, Mn, Fe, Co, Ni, and Cu). (Also rare earths)*
- *Color in hand specimen may not be diagnostic.*
- *Color in streak generally indicates presence of iron or other transition metals.*

Chatoyance, Asterism, and Luminescence

- *Chatoyance and asterism are optical effects due to diffraction of light from small inclusions.*
- *Luminescence is emission of light.*
 - *Visible or UV (black light)*
 - *Tribo-luminescence: glow when rubbed*
 - *Cathodo-luminescence is emission of light from electron bombardment*

Asterism: Star Sapphire



Cleavage and Fracture

- *Crystals tend to break on planes of weakness.*
 - *Cleavage: perfect*
 - *Parting: irregular*
 - *Hackly: very irregular*
 - *Conchoidal Fracture: no cleavage, breaks like glass.*

Hardness

- | | |
|---------------|---------------|
| • 1. Talc | 6. Orthoclase |
| • 2. Gypsum | 7. Quartz |
| • 3. Calcite | 8. Topaz |
| • 4. Fluorite | 9. Corundum |
| • 5. Apatite | 10. Diamond |

Density

- *Density units are g/cm³ (water is 1.0)*
- *Densities range from 0.92 for ice to ~1.8 for some zeolites to 22 for Os.*
- *Most silicates are 2.5 to 3.5.*
- *Most sulfides are 4.5 to 6.0*
- *Iron metal is ~8*
- *Lead is ~13*
- *Gold and platinum are 19-22.*

Tenacity: How does it deform?

- *Brittle: Fractures (quartz)*
- *Ductile: Malleable (gold)*
- *Sectile: Cut with a knife (mica)*

Unique Properties

- *Ferro-magnetism*
- *Taste (Don't do it. It might be witherite.)*
- *Radioactivity (U and Th minerals)*
- *UV Fluorescence*
- *Piezoelectricity (acentric crystals)*
- *Pyroelectricity (acentric crystals)*

Other Properties

- *Optical (Index of refraction)*
- *Optical (Birefringence)*
- *Optical (Spectroscopy)*
- *Chemistry (X-ray and electron fluorescence)*
- *X-ray diffraction (+ electron and neutron)*
- *Other spectroscopies*
 - *IR* *Raman (visible)*
 - *Mössbauer(γ)* *Auger (electron)*