9

Materials Engineering

Materials Engineering

- Design, development of new materials
- Production using specific materials
- Materials engineers work in many fields
  - Specialize in one material

Volodymyr Krasyuk/Shutterstock.com

Professional Aspects

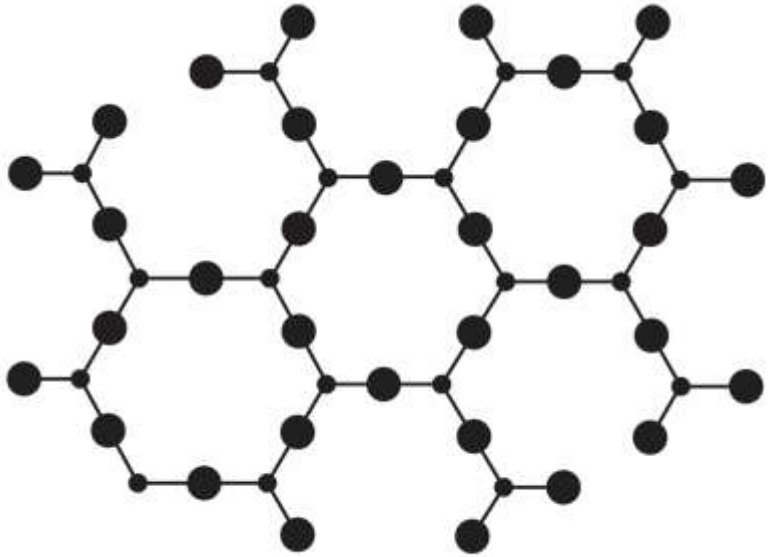
- Bachelor's degree required
- Lots of Chemistry
- Professional societies
  - ASTM
  - Materials Information Society
  - Materials Research Society
  - NACE International
  - Other groups for ceramics, plastics, metals

Principles of Materials Engineering

- Materials used in all engineering fields
- Engineers must understand
  - Types of materials
  - Properties of materials

Nano-Tex

Crystalline Atomic Structure

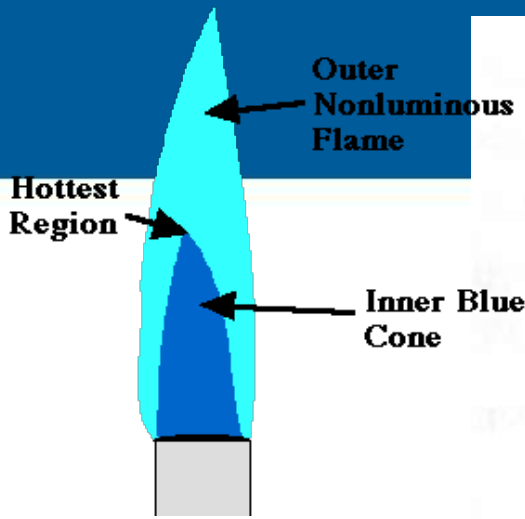


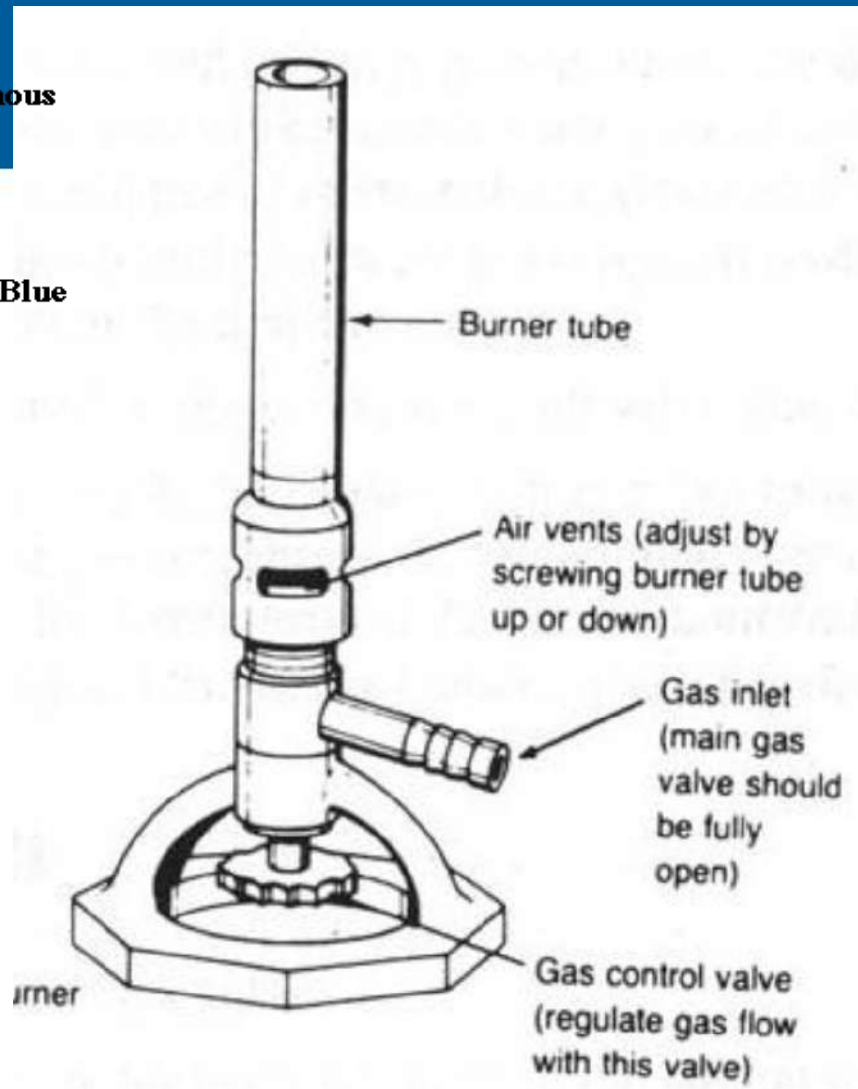
Crystalline

Goodheart-Willcox Publisher

Heat-Treating Steel

You will use a Bunsen burner.
-To light the burner, connect the burner to the gas outlet using tubing.
-Turn the gas on at the outlet by making the handle parallel to the tubing.
-Hold the sparker above the burner and click it.
-You adjust the height of the flame by adjusting the amount of gas that is flowing into the burner.
-Each Bunsen burner has a vertical tube that rotates and an adjustable valve located on the base.
-The ideal flame is blue in color and has a double cone.
-The hottest part of the flame is at the top of the inner cone.





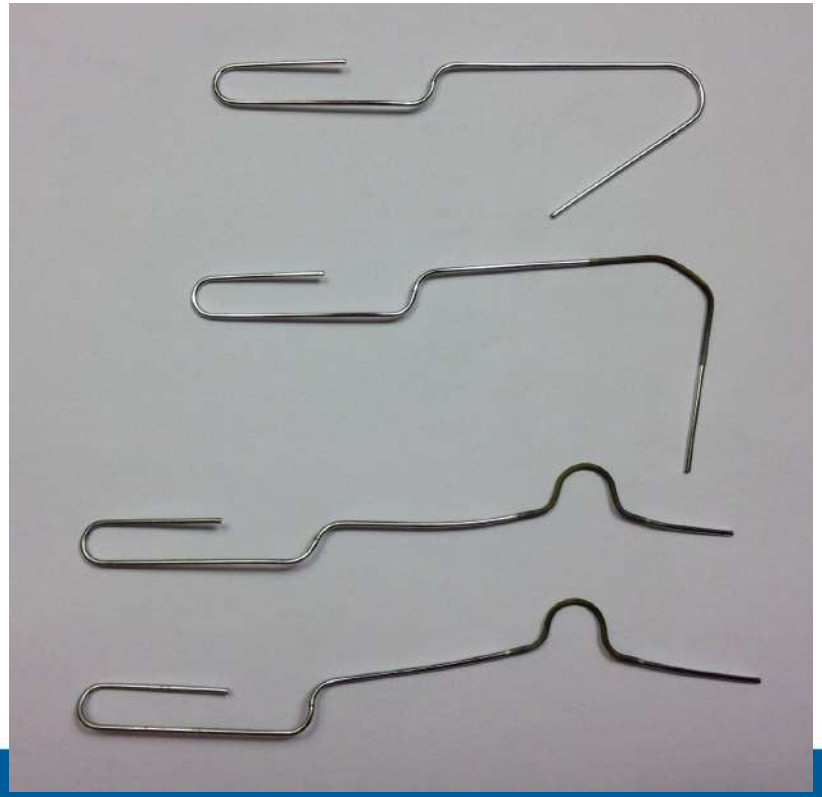
Heat-Treating Steel

Affects

- Hardness
- Strength
- Workability

By Changing

- Crystal structure
- Location of carbon atoms
- Form of carbon



CONTROL

ANNEALED

QUENCHED

TEMPERED

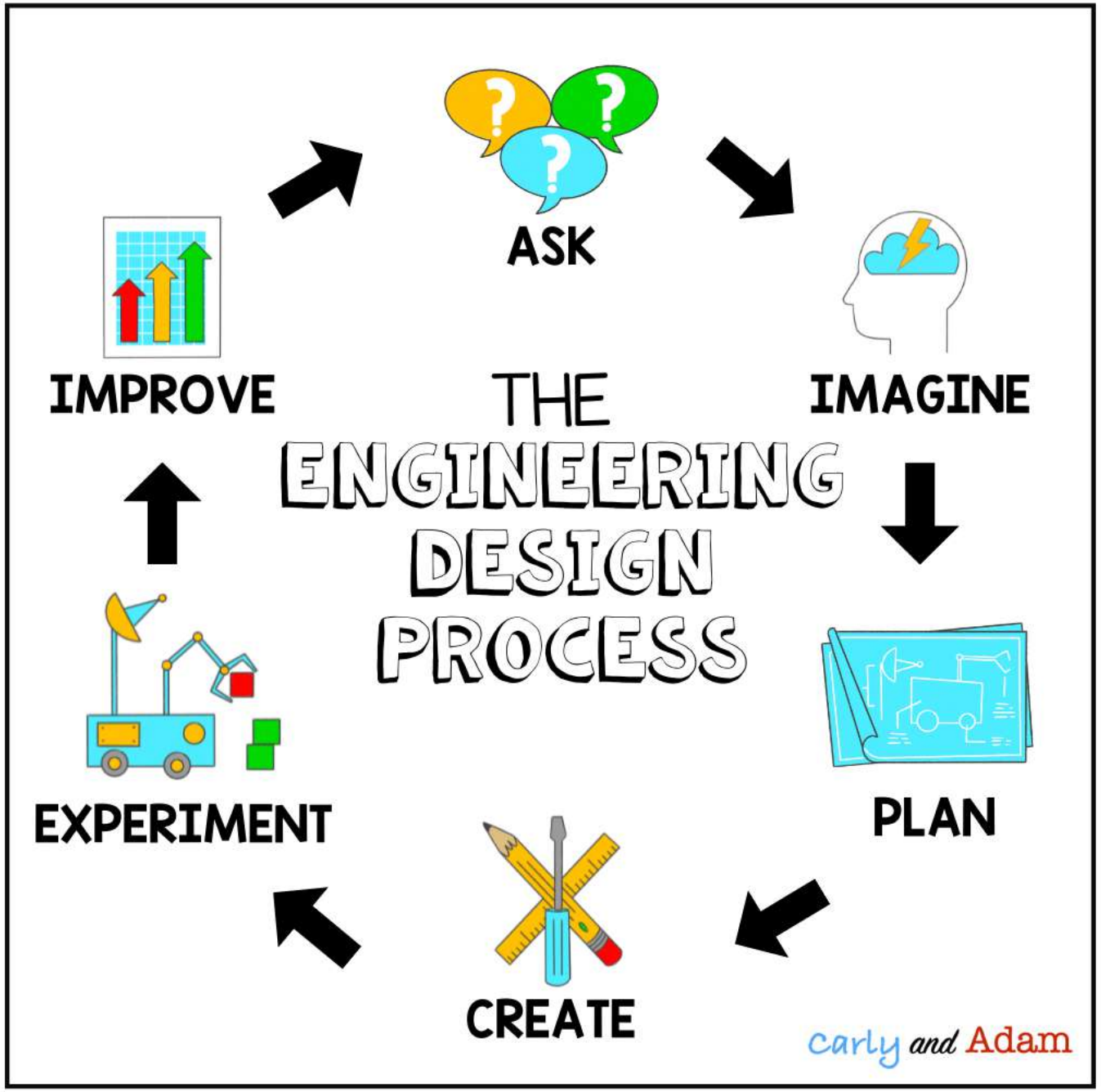
Heat-Treating Steel

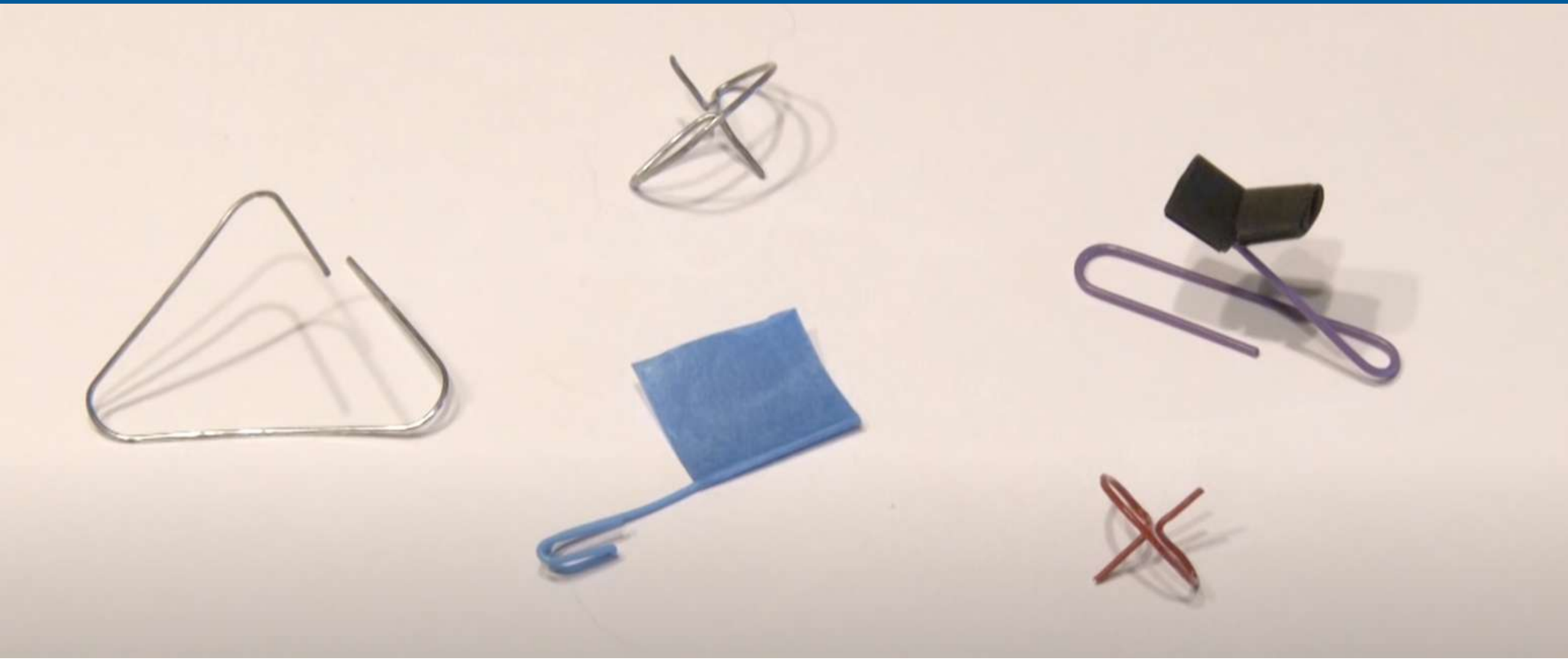
paper clips

- **Paper clip** – Low-carbon steel – 0.2% carbon by weight

Heat-Treatments

- **Control** – No treatment (bends but does not keep shape well)
- **Anneal** – Heat red hot - air cool (makes easily bendable)
- **Quench** – Heat red hot, fast cool in water (even more bendable)
- **Temper** – Heat red hot, cool with water, reheat 2nd time (starts to be brittle after too much heating)





Google “Easy Paperclip Projects” – watch video and create 5 objects for 100 points each