How to use microwave oven (carefully)

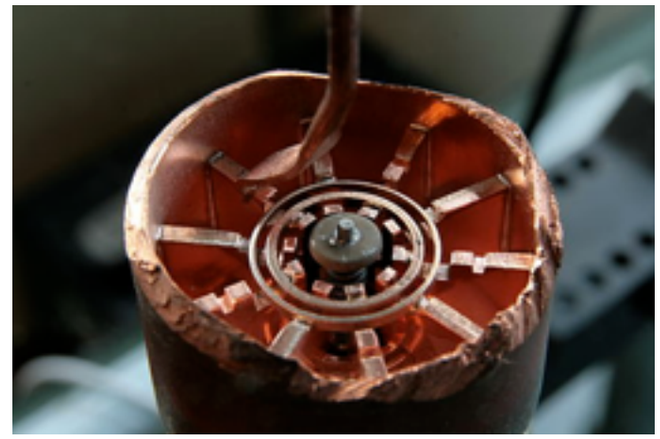
Aug 12, 2014

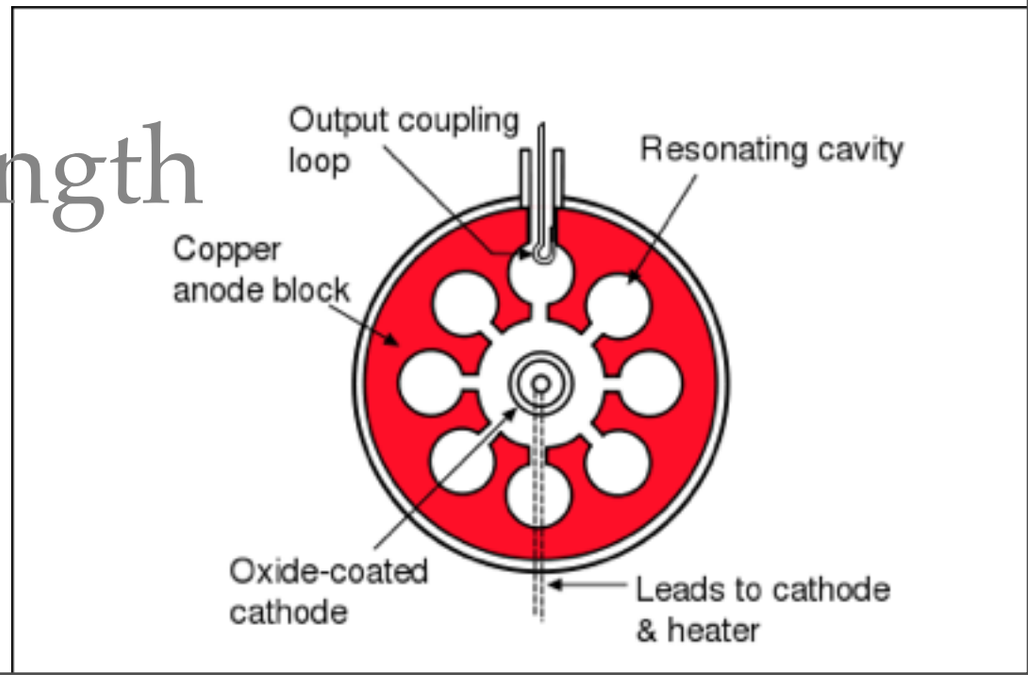
Tea talk

Ben Huh?

How does it work?

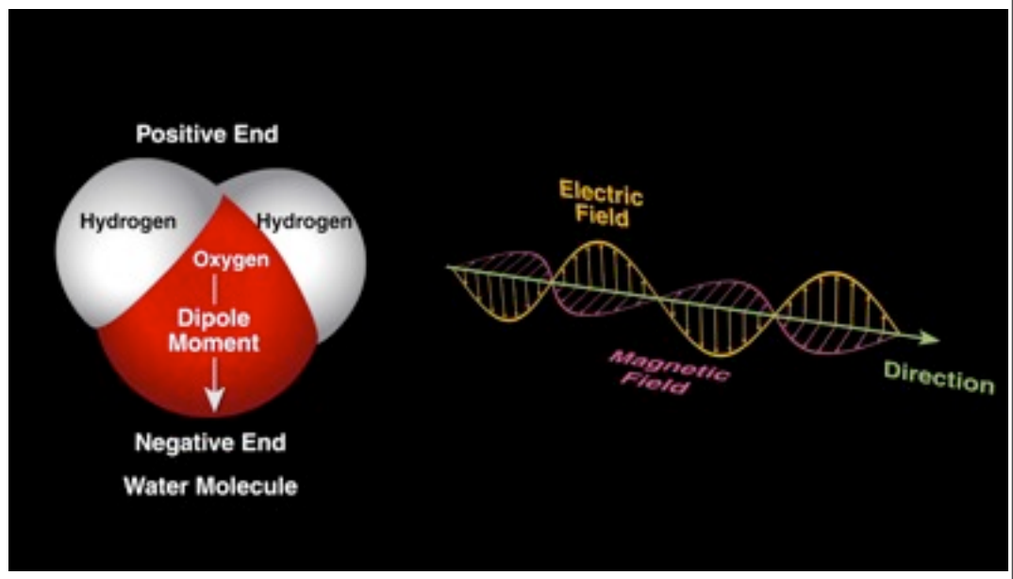
- Microwave: EM wave with wavelength 1m ~ 1mm
- Microwave-oven:
  - Magnetron
  - 2.45 Ghz, 12 cm wavelength

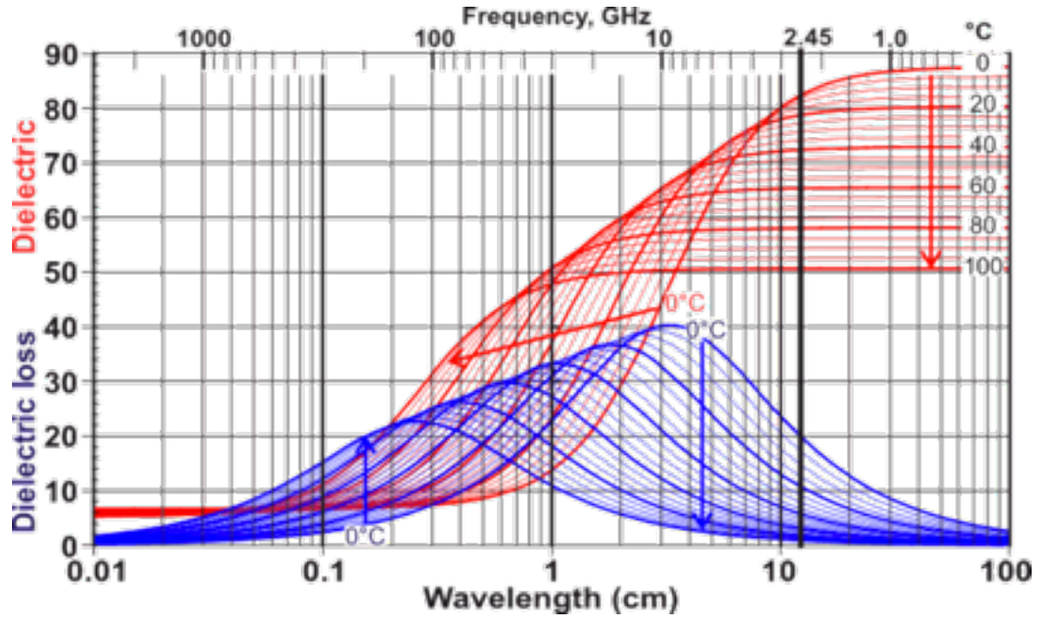




Dielectric Heating

- EM wave makes water molecule to rotate, which transfers to kinetic energy
- Liquid water has broad absorption spectrum (hydrogen bond network)
  - Bad for underwater radio communication
  - peaks near 10 GHz (3cm)





Misconception: Metal

- Metals reflect EM waves, not absolve
- MW oven is covered in metals
- Mirror!

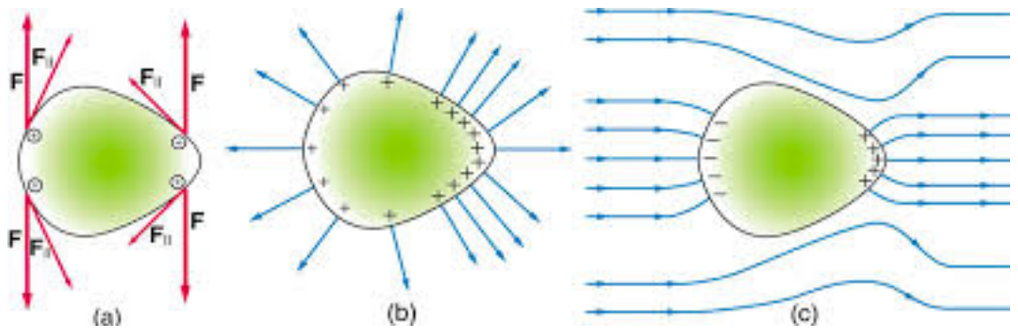
Misconception: Metal

- So why does this happen?

- Metals reflect EM waves, not absolve
- MW oven is covered in metals
- Mirror!

Misconception: Metal

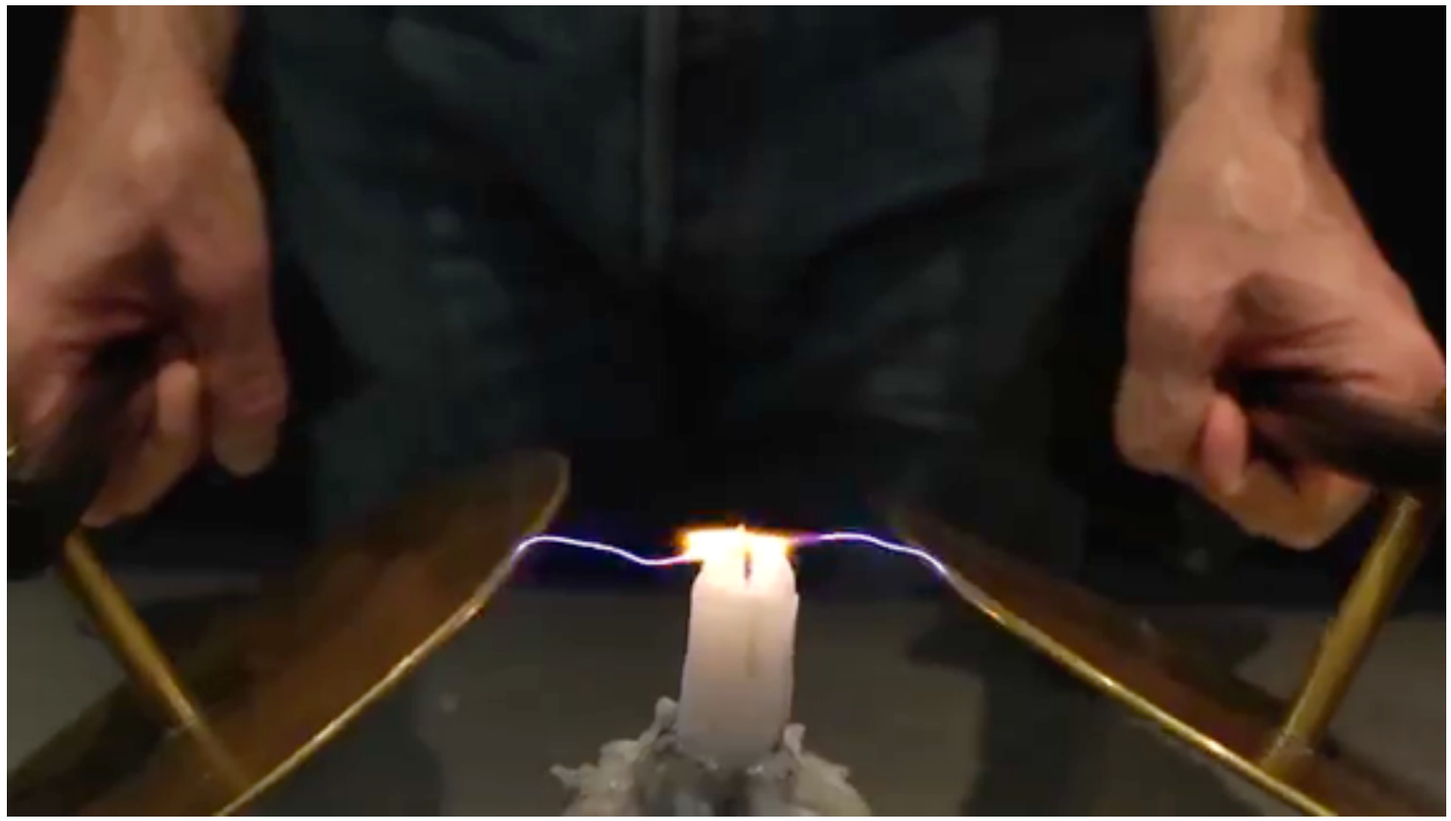
- Shape matters:
  - High E field near the sharp edge
  - Ionization of air -> Spark!
  - Also applies to (sharp) hot-dogs



Misconception: Grape

- Is grape safe in Microwave?
  - Yes / No - Again, depending on shape
- Can create plasma: (charged ion gas)
- Live demonstration

Flame is also plasma



- So.....

  more microwave demonstration

Other cool experiments

- Super heating water
- Eggrenade - york gets much hotter