

Activity: Popping an Electrolytic Capacitor

I typically do this at the start of first order time domain. I show them a couple of large and small electrolytic capacitors, both vented and un-vented. Usually a student notices the negative sign on the side, or the short lead/long lead, so we talk about the polarity of the capacitor and why these have polarity but other caps don't.

Initial questions

- 1) What do you notice about the side of the capacitor? (polarity)
- 2) What do you notice about the tops of the capacitor? (vents)
- 3) What do you think the purpose of the X is? (vents)
- 4) What will happen if we reverse bias the electrolytic capacitor?

I then briefly talk about how an electrolytic capacitor is designed and why you can't reverse bias it without damaging it.

The demo

Students stand >2 m back from the breadboard. Start with the vented capacitor. Place breadboard and cap inside acrylic box/tube/etc to contain flying pieces. Connect alligator-banana cords to the capacitor, then plug into the power supply and enable. Supply a positive voltage and announce the current through the cap. Stop, supply a negative voltage, and announce the current as it changes.

The cap needs around -12 V to pop. The cap current should increase from about 100 mA to the limit of the power supply (1 A?), stay there for a few seconds, then pop. If the current starts to decrease before the cap pops, you need to increase the voltage.

Repeat the negative voltage demo with an unvented capacitor (more spectacular pop).

Note: The capacitor spews a kind-of nasty electrolyte everywhere, so I typically wear gloves and safety glasses to avoid getting it on my hands and then face.

Follow up questions for students

- 1) What happened to the capacitor current when the voltage was positive? When the voltage was negative?
- 2) Do all capacitors have a polarity? Why or why not?
- 3) What will you do to be safe around electrolytic capacitors?