Re: capacitor questions

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Charge would be pumped until you reached the open−circuit voltage of the solar cell. Why would you think it would go beyond that? (Unless of course the capacitor or something else breaks down before that point.)

If on the other hand you were to shoot electrons at one plate and positive ions at the other, you'd eventually get to the point where the electrons were repelling each other with a force great enough that they would fly off (toward the positive plate), and/or the ions would do similarly. With an air dielectric, you reach a point where the field strength is great enough that the stray electron (there are pretty much always some around) gets accelerated enough by the field that when it hits an air molecule, it knocks off one or more electrons, and pretty soon you have an arc. The lower the air pressure, the longer the mean free path before the electron strikes something, so the lower the electric field required to start an arc, at least up to the point where the mean free path approaches the plate separation.

Capacitors with a vacuum as dielectric don't store energy in polarization of the dielectric, I suppose. The energy is stored very similarly to the energy stored when you lift a weight and place it on a shelf. There is a potential for doing work on the stored charge; the potential is the voltage. If you wish, you can say that the energy is stored in an electric field; but an equally valid way to think of it is that the energy is stored in the fact that two charges (positive and negative) are attracting each other, with a force that can be allowed to act over a distance, just as the gravitational force can be allowed to act on the weight over a distance.

Imagine a capacitor formed of two large plates with some separation which is small compared with the size of the plates, with a vacuum between the plates. Charge the capacitor with charge Q. The plates will see a force pulling them together. Allow the plates to come together half the initial separation. The charge remains the same, but the voltage drops by half, because you have removed half the available energy. At the same time, the capacitance has doubled. Note that this is all consistent with C=Q*V and stored energy = (C*V^2)/2. Also note that if you pull the plates apart, you put energy into the system, and the voltage goes up. (It's how some high voltage generators work...)

Cheers,
Tom
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Hi,

if you hooked up a solar cell in space to a capacitor, and let the sun power the solar cell and charge up the capacitor indefinitely, more and more electrons will be pumped to the negative plate of the capacitor, until what limit? Assuming the dielectric can handle the voltage, will all of the free electrons eventually be pumped to the negative side of the capacitor, or is there no limit to the number of electrons that can be pumped leading to a voltage only limited by the dielectric breakdown voltage? If there is no limit to the number of electrons that can be pumped to the negative plate, where do these electrons come from?

I am a bit confused about where the capacitor stores its energy, is it stored as an electron differential in the two plates or is it stored as a polarization in the dielectric? (similar to an inductors core magnetization)

cheers,
Jamie

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