7. Recovery Voltage

When charged aluminum electrolytic capacitor is discharged by shorting the terminals and left open for a while, the voltage between terminals of the capacitor rises again. This increased voltage is called “regeneration voltage”. The mechanism of this phenomenon is explained as follows.

In general, the structure of a capacitor is as shown in Figure 7.1, with a dielectric substance between two electrodes. Dielectric of an aluminum electrolytic capacitor is an oxide film formed on surface of aluminum foil by forming process. When voltage is applied to the dielectric, polarization occurs due to dielectric effect. The polarization does not immediately respond to the electrical field, and may delay by the elastic viscosity of the molecules. There are various types of polarization, including space charge polarization, atomic polarization, and electronic polarization.

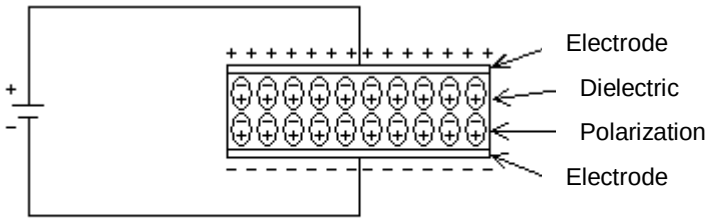

Figure 7.1

When voltage is applied to a dielectric, atomic polarization and electronic polarization are completed in a short period of time, but other types of polarization, such as space charge polarization, are thought to require longer time to complete. When the voltage between the terminals is allowed to discharge to zero and the circuit between the terminals is left open thereafter, the polarization that requires more time appears between the terminals, creating recovery voltage.

Recovery voltage peaks between one and three weeks after the terminals are disconnected, and then gradually decreases. Recovery voltage tends to be higher in larger capacitors such as capacitors with screw terminals and self supporting terminals.

If recovery voltage is present, shorting the terminals will create a spark. This could frighten a person working with the capacitor, and there is also the risk of damaging low-voltage devices in the circuit such as CPUs and memory.

To prevent this happening, it is recommended to discharge the capacitor with a resistor of about 1 kΩ before use.