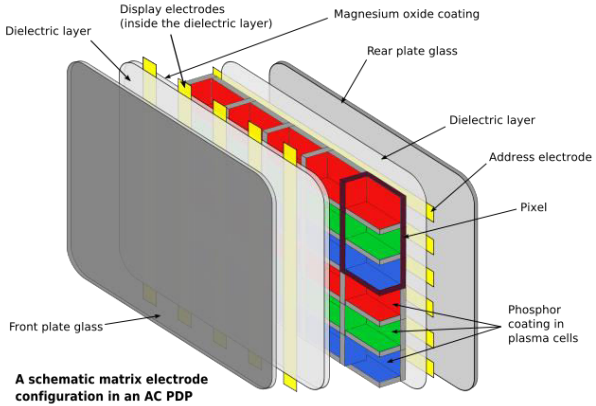
LCD Display

- A **liquid crystal display** (**LCD**) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs do not emit light directly.
- They are used in a wide range of applications including: computer monitors, television, instrument panels, aircraft cockpit displays, signage, etc. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones. LCDs have displaced cathode ray tube(CRT) displays in most applications. They are usually more compact, lightweight, portable, less expensive, more reliable, and easier on the eyes. They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they cannot suffer image burn-in.

Plasma Display

A plasma display panel is a type of flat panel display common to large TV displays (80 cm/30 in or larger). They are called "plasma" displays because the pixels rely on plasma cells, or what are in essence chambers more commonly known as fluorescent lamps. A panel typically has millions of tiny cells in compartmentalized space between two panels of glass. These compartments, or "bulbs" or "cells", hold a mixture of noble gases and a minuscule amount of mercury. Just as in the fluorescent lamps over an office desk, when the mercury is vaporized and a voltage is applied across the cell, the gas in the cells form a plasma. (A plasma is a collection of particles that respond strongly and collectively to electromagnetic fields or electrical charges, taking the form of gas-like clouds or ion beams.) With flow of electricity (electrons), some of the electrons strike mercury particles as the electrons move through the plasma, momentarily increasing the energy level of the molecule until the excess energy is shed. Mercury sheds the energy as ultraviolet (UV) photons.



A schematic matrix electrode configuration in an AC PDP

CRT-LCD-Plasma Comparison

CRTs are slightly better than LCDs because:

- cost less.
- displaying more colors.
- reacting faster and displaying moving images without smearing or artifacts.
- using emissive technology (generate their own light) boarder viewing angle.

LCDs are better than CRTs because:

- smaller and lighter.
- consuming less energy.
- crisper image because each pixel is displayed by a specific set of LCD cells.
- reduced eyestrain and fatigue (no flicker)
- emitting much fewer low-frequency electromagnetic emissions than CRTs.
- pivoting in landscape or portrait mode.
- less prone to interference from other devices
- always perfect image geometry
- reflecting less glare than most CRTs.

Plasma vs. LCDs

- Plasma will outperform LCD by providing lots of dark and better contrast,

but LCD outperforms plasma in brightness and color. (larger screen sizes, burn-in)

Digital Light Processing-DLP

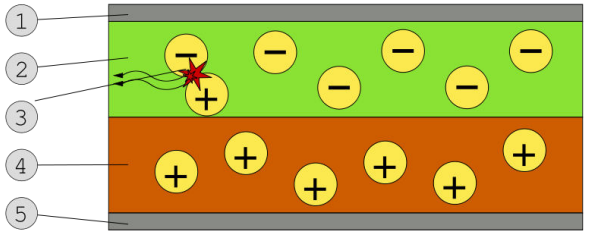
A semiconductor-based display, from Texas Instruments (1993)

- A panel of micromirrors are mounted on tiny hinges that enable them to tilt either toward or away from the light source in a DLP™ projection system (ON/OFF)-creating a light or dark pixel on the projection surface.
- The white light generated by the lamp in a DLP™ projection system passes through a color wheel as it travels to the surface of the DMD panel.
- DLP™ projection system 1-chip and 3-chip systems

Lecture No 11 Topic: Organic light emitting diode (OLED)

An **organic light emitting diode** (**OLED**) is a light-emitting diode (LED) in which the emissive electroluminescent layer is a film of organic compounds which emit light in response to an electric current. This layer of organic semiconductor material is situated between two electrodes. Generally, at least one of these electrodes is transparent. There are two main families of OLEDs: those based upon small molecules and those employing polymers. Adding mobile ions to an OLED creates a Light-emitting Electrochemical Cell or LEC, which has a slightly different mode of operation.

Schematic of a bilayer OLED



1. Cathode (−)
2. Emissive Layer
3. Emission of radiation
4. Conductive Layer
5. Anode (+)