



E-paper Technology



Instructor

Faiz

Professor

Rethwan

Assistant

AIUB

HELLO! EVERY ONE

American International University-Bangladesh (AIUB)

Group Members-

1.Shahriar Niloy.	14-26876-2
2.Kabir,Md.Ahshan	14-26903-2
3. Shahabuddin,khan Istiak	13-24372-2
4.Hossain,Mohammad Ismail	14-27342-2
5. Nurnobe ,Md.	14-26845-2

Contents

- Introduction
- Construction of E-paper
- Working Technologies
- Properties
- Comparison E-paper & LCD
- Advantages & Disadvantages
- Application
- Future scope
- Conclusion

HISTORY OF E-PAPER

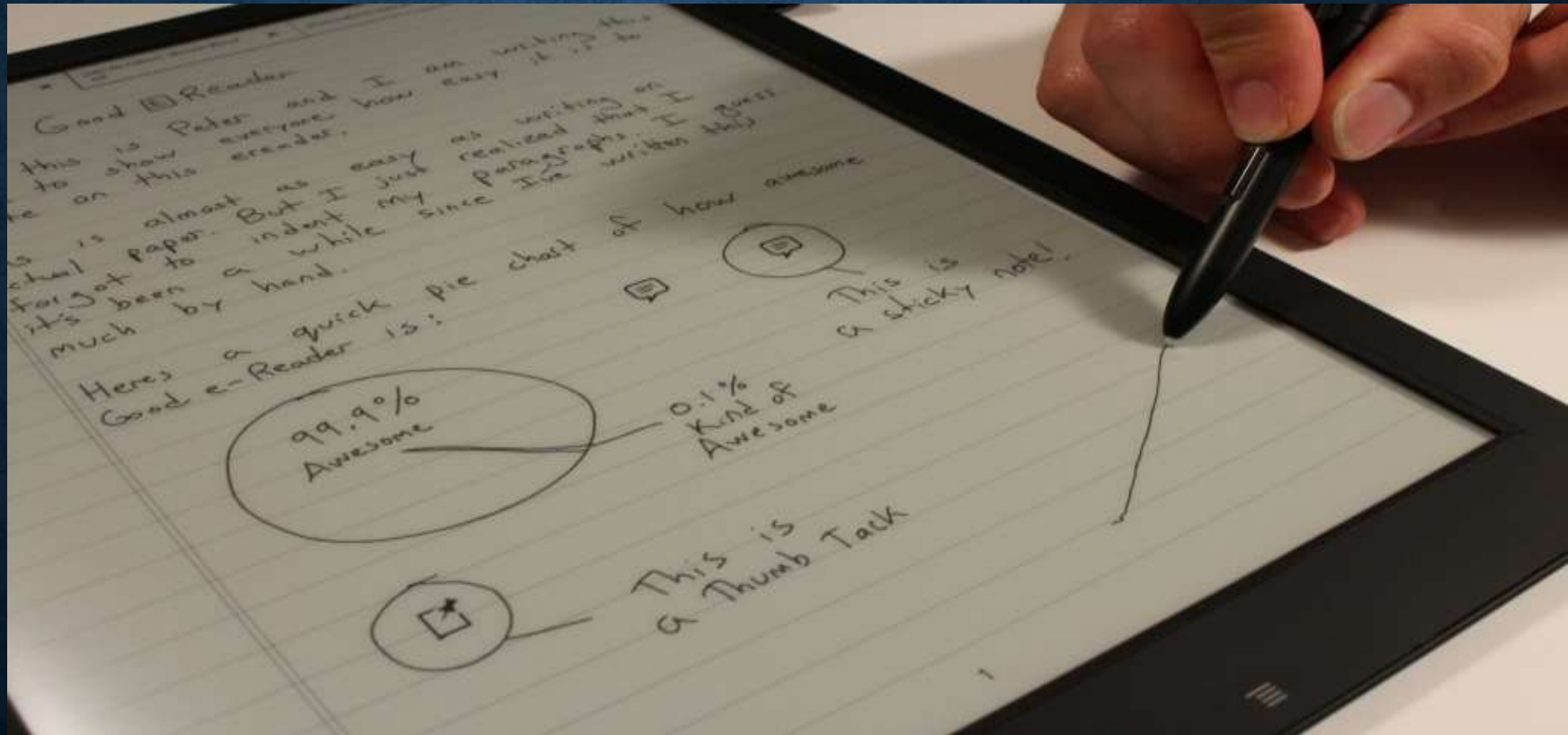
- In 1970, one of the Xerox's teams led by Nicholas K. Sheridon gave the concept of e-paper
- The first electronic paper, called Gyricon
- It took almost 30 years to enter in the market
- In 2004 Sony released in Japan, the first e-book reader with an electronic paper E Ink display
- The contrast ratio in electronic displays available as of 2008 approaches newspaper

WHAT IS E-PAPER ?

- E-Paper is called Electronic Paper or Electronic ink Display or Radio paper
- It reflect light like ordinary paper.
- It is capable of holding text and images.
- It is flexible while using plastic materials and electronics.
- It is more comfortable to read than conventional display.
- It has a wider viewing angle.
- It can read directly from sunlight without fading images.

E PAPER

- Light weight and durable.
- Low power consumption.
- A digital pen is also used create handwriting document.



CONSTRUCTION OF E-PAPER

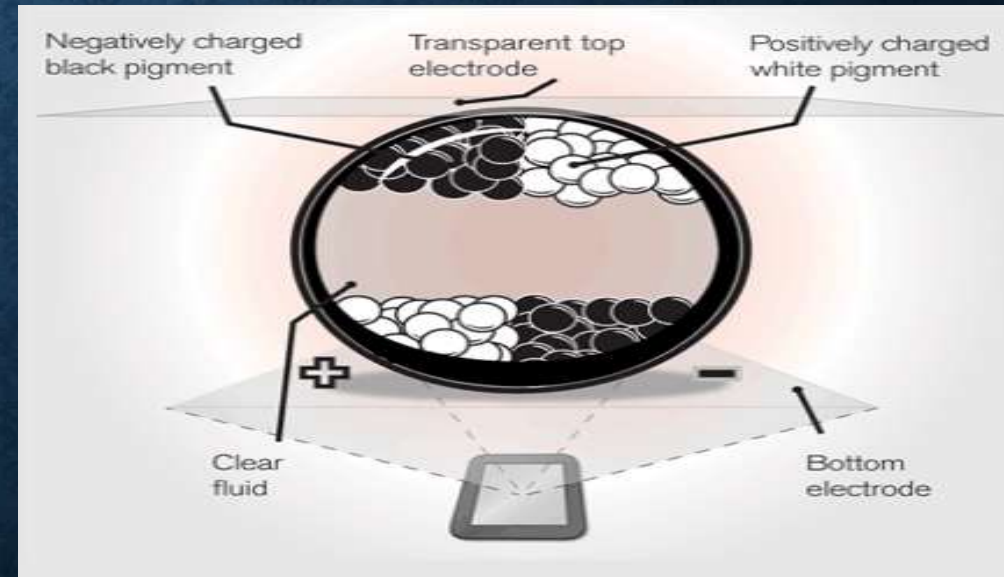
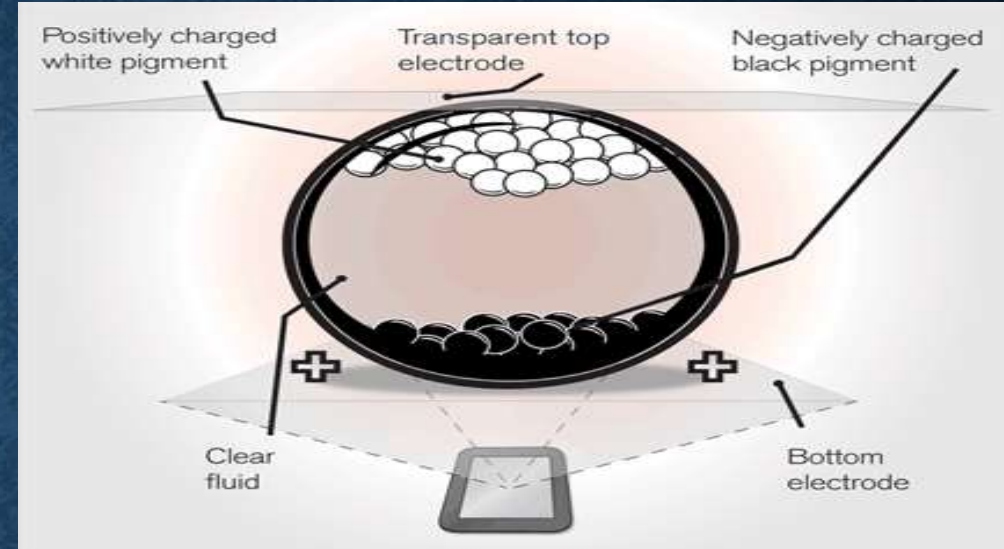
- It has two different parts.
 - Front plane.
 - Back plane.

BACK PLANE

- The back plane consist of **electronic circuits**.
- Back plane is made up of organic thin film transistor arrays which provide voltage needed by the E-Paper.
- To form an E-ink electronic display the ink is printed onto a plastic film that is laminated to a layer of circuitry.

FRONT PLANE

- The front plane consist of E-ink.
- E-ink is made up of millions of tiny microcapsules.
- Microcapsules have diameter of the order of 100 microns.
- Each microcapsule contains positively charged white particles and negatively charged black particles suspended in a clear fluid .
- When a positive or negative electric field is applied, corresponding particles move to the top of the microcapsule where they become visible to the viewer. This makes the surface appear white or black at that spot.



E-ink 2-pigment system

TECHNOLOGIES PROPOSED SO FAR:

- Gyricon
- Electrophoretic display
- Electrowetting

GYRICON

- First electronic paper.
- Polyethylene spheres (75-106 micrometers).
- Each sphere is a **janus particle** composed of negatively charged black plastic on one side and positively charged white plastic on the other.
- Embedded in transparent silicone made sheet, with each sphere suspended in a bubble of oil for rotation .
- Voltage applied to each pair of electrodes determines whether the white or black side is face-up.

APPLICATIONS :

Gyricon can be used for products such as e-book ,e-newspaper , portable signs ,rollable displays etc.

LIMITATIONS OF THIS METHOD

1. Low brightness
2. Low resolution.
3. Lack of color.

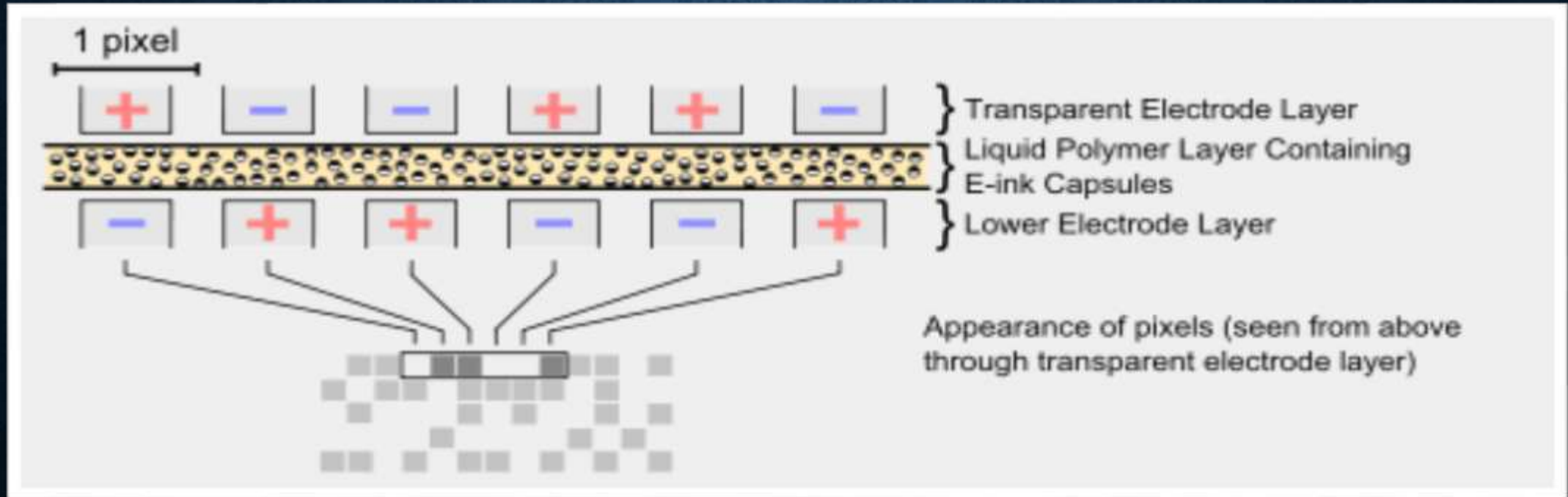
ELECTROPHORETIC

- Each E-ink capsule contains an oily solution containing black dye (the electronic ink), with numerous white titanium dioxide particles suspended within these capsules are dispersed in a hydrocarbon oil in which dark-colored dye and charging agents are also added.
- Capsule diameter is 40 micrometer.



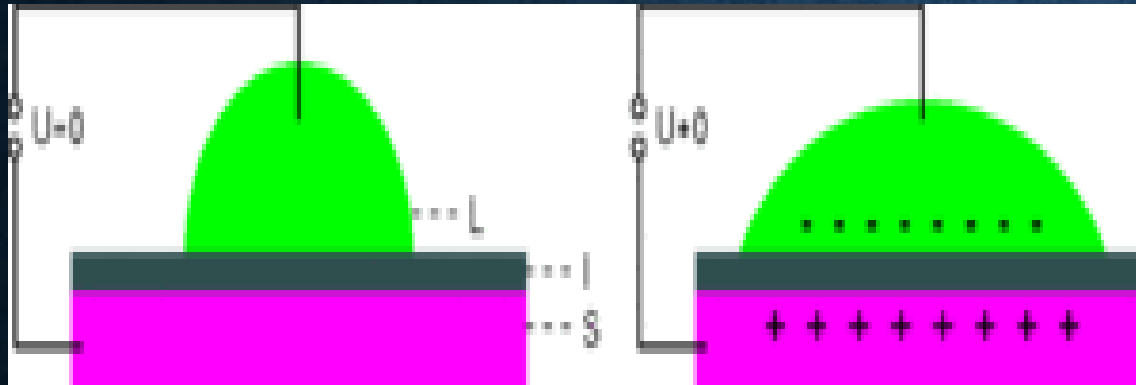
- Gap between the two conducting plates is of the order of 100 micrometers and the mixture is placed between these plates.
- When a voltage is applied across the two plates, the particles will migrate electrophoretically to the plate bearing the opposite charge from that on the particles.

- When the particles are located at the front (viewing) side of the display, it appears white, because light is scattered back to the viewer by the high refractive -index titania particles.
- When the particles are located at the rear side of the display, it appears dark, because the incident light is absorbed by the colored dye.



ELECTROWETTING

- Based on the phenomenon of **Electrowetting effect**.



- based on controlling the shape of a confined water/oil interface by an applied voltage.
- With no voltage applied, the (coloured) oil forms a flat film between the water and a hydrophobic (water-repellent) insulating coating of an electrode, resulting in a coloured pixel.
- When a voltage is applied between the electrode and the water, the interfacial tension between the water and the coating changes. As a result the stacked state is no longer stable, causing the water to move the oil aside.
- This results in a partly transparent pixel, or, if a reflective white surface is used under the switchable element, a white pixel.

PROPERTIES

- Ultra-thin and flexible energy cell.
- Eliminates the cost of the battery , weight and volume of the battery holder.
- Can be made into almost any shape.
- Can be integrated on almost any surface.
- Low cost and simple to produce, using printing process.
- Environmentally friendly, non-caustic, no possibility of explosion, burns, or overheating.

COMPARISON OF E-PAPER & LCD

Electronic Paper Display	Liquid Crystal Display
Wide viewing angle	Best image only from one position
Readable in sunlight	Can be difficult to see in sunlight
Holds image without power drain	Required power to hold images
Plastic or glass	Glass only
Light Weight	Power supply and glass make LCDs relatively heavy
Thin (~1 mm)	Thick (~7 mm)

ADVANTAGES

- Paper-like Readability.
- Ultra-Low Power Consumption.
- Clarity.
- Reduced Eyestrain.
- Mobile Display Solution.
- Hypertext.
- Multimedia Information.
- Include Graphics.
- Inexpensive.

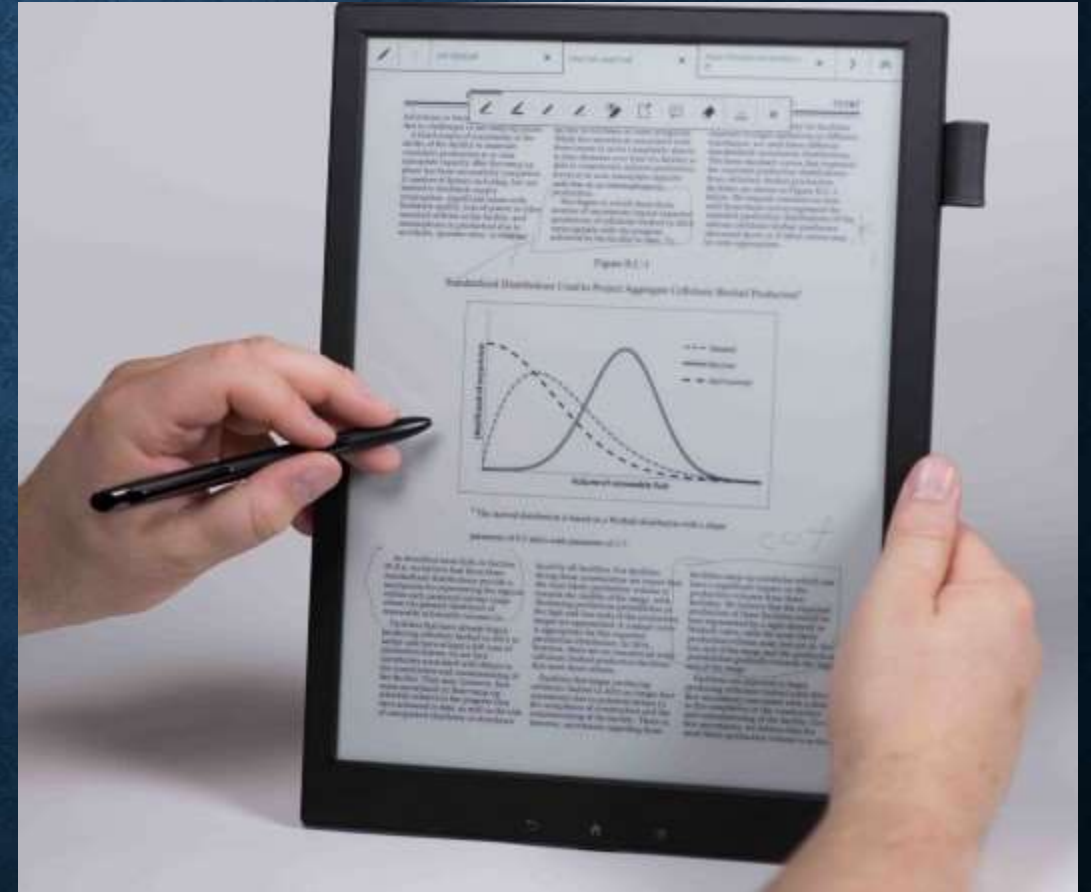


DISADVANTAGES

- Very low switching speed
- Electrochemical complexity
- Slow response to change
- Too slow for video
- Problems in extremes temperatures, humidity

APPLICATIONS

- ❑ Wristwatches
- ❑ e-Book reader
- ❑ Electronic Shelf Label
- ❑ Smart Card Display
- ❑ Mobile phones
- ❑ E-Newspaper
- ❑ Time Table at Stations
- ❑ Electronic Billboards
- ❑ Status displays
- ❑ Digital Photo Frames



FUTURE OF E-PAPER

- The tube will contain a tightly rolled sheet of e-paper that can be spooled out of a slit in the tube as a flat sheet, for reading, and stored again at the touch of a button. Information will be downloaded—there will be simple user interface—from an overhead satellite, a cell phone network, or an internal memory chip. This document reader will be used for e-mail, the Internet, books downloaded from a global digital library that is currently under construction, technical manuals, newspapers (perhaps in larger format), magazines, and so forth, anywhere on the planet. It will cost less than \$100, and nearly everyone will have one!

CONCLUSION

Researches found that in just few years this technology can replace paper in many situations, leading us to think of a truly paperless world.

*Thank
you*

