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# A New Form of Change in Computer Memory and Plastic Memory

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**Abstract**—A line of advances in organic new memory technology is demonstrated that enable an entirely new low-cost Memory technology. Inventors incorporate these advances with the one of the most flexible material PLASTIC. This novel memory technology can be utilized in a 3D onetime-programmable storage array. Without the prohibitive costs of silicon processing, this memory is able of setting cost points several orders of magnitude lower than their inorganic counter part. They have also progressively integrated this technology onto flexible plastic substrates. Combined with stacking these vertical memory elements can create read only memory densities denser than many inorganic memories. At a fraction of the cost a conducting plastic has the potential to put into a mega bit of data in a mille meter -square device-10 times denser than current magnetic memories. This system is cheap and fast, but cannot be rewritten, so would only be suitable for permanent storage. The system sand winches a blob of a conducting polymer called PEDOT and a silicon diode between perpendicular connections. the key to the new technology was discovered by passing high current through PEDOT (Polyethylene dioxythiophene) which converts it into an insulator. Rather like blowing a fuse .The polymer has two possible states conductor and insulator that form the one and zero, necessary to put into digital data.

**Keywords** —PEDOT(Polyethylene dioxythiophene) , plastic, GPS, RFID, Plastic Waste; Re-Use; Gasification; Syngas; Char; Sustainability; Reaction Rate.

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## 1 Introduction

The techniques of ubiquitous computing are extremely attractive. The idea of electronics integrated into everyday items is extremely attractive, but immediately well beyond the cost structure inherent to silicon chips. From integrated displays to radio-frequency clarification, silicon solutions remain economically out of reach due to high material costs, processing costs, and the need for safe-room fabrication. In addition Complementary transfer-free approach has recently been introduced. Standard fabrication processes improves the flexibility of the substrate. These approaches are all geared towards achieving fully flexible electronic systems. The three main components in any electronic system are [1] processing units; [2] the main memory; and [3] storage. be manipulated and ''fixed'' to a temporary and dormant shape under specific conditions of temperature and stress, The major focus points of organic-based electronics to date include chemical sensors, show and the pixel addressing circuits.

## 2 Literature Review

The recent progress in the memory was a new form of permanent computer memory which uses plastic and may be much low cost and speeder than the existing silicon Circuits which were invented by researchers at Princeton University experienced with Hewlett-Packard. This disk is technically a hybrid that contains a plastic film, a flexible foil substrate and some silicon. The discovery, gained by HP and Princeton in Forrest's university laboratory, came during work with a polymer material called PEDOT- a perfect conducting plastic used as coating on photographic film and as electrical consult on video displays. It was Princeton postdoctoral Steven Moller, now with Hewlett Packard, who found that PEDOT conducts electricity at short voltages but permanently, loses its conductivity when exposed to higher electrical currents, building it act like a circuit breaker.

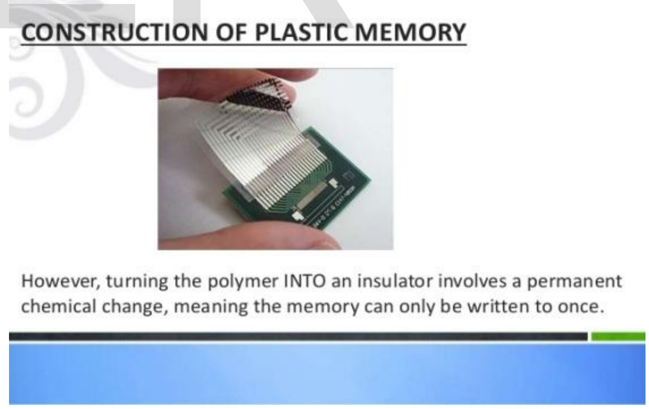


Fig 1: Construction of Plastic Memory

## 3 Proposed Work

### 3.1 Overview of Plastic Memory

Plastic memory is one type of organic semiconductor device. Imagine a scenario where the memory stored in your digital camera or personal digital assistant is specially based on one of the most flexible materials made by man: PLASTIC. Researchers at HP Labs and Princeton University are excited a new memory Technology that could store more data and cost less than traditional silicon based chips for mobile systems such as handheld computers, cell phones and MP3 players. A conducting plastic has been used to make a new memory technology with the potential to store a megabit of data in a millimeter-square device - 10

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times broader than current magnetic memories. The device should also be cheap and fast, but cannot be rewritten, so would only be perfect for permanent storage. The beauty of the device is that it combines the best of silicon technology - diodes - with the ability to form a fuse, which does not exist in silicon," says Vladimir Bulovic, which works on organic electronics at the Massachusetts Institute of Technology. This utilizes a previously unknown property of a lower, transparent plastic called PEDOT - short for Polyethylene dioxythiophene. The inventors say that information densities as high as a megabit per square millimeter can be Possible. By stacking layers of memory, a cubic centimeter device could pick as much as a gigabyte and be lower enough to compete with CDs and DVD. However, turning the polymer INTO an insulator includes a permanent chemical change, meaning the memory can only be written to once. Its builders say this makes it ideal for archiving images and other information directly from a digital camera.

### 3.2 NVM Architectures

NVM architectures are an important element in memory design that can be classified into three main categories: the 1T, where the memory cell is composed of a single transistor („T" stands for transistor); the 1T1C or 1T1R, where the memory cell is composed of an access/select transistor and a non volatile storage structure („C" stands for capacitor and „R" stands for resistor); and the 2T2C (two transistors and two capacitors per memory bit). Other variations of these main architectures and different arrangements, such as the 1T2C, have also been reported. Furthermore, there are differences in the way memory cells are connected to each other. For instance, NOR-type flash and NAND-type flash memories both have 1T architecture but different cell connections. MRAM performs on typical RAM (NVM) in various features. The features like retaining data after the power supply cut off, high power speed and less consumption of electricity [4].

### 3.3 Working of This New Flexible Magnetic Plastic Memory Device

This new plastic memory device performs on magneto resistive random access memory (MRAM). This MRAM uses magnesium oxide based magnetic tunnel (MTJ) to data.

## 4 Magnetic memory chip works within bendy plastic

A new technique implants a high-performance magnetic memory chip on a flexible plastic surface without compromising performance. This invention, developed at the National University of Singapore, brings researchers a step closer towards making flexible, wearable electronics a reality. "Flexible electronics will become the norm in the near future, and all new electronic components should be compatible with flexible electronics," says study leader Yang Hyunsoo, an associate professor in the department of electrical and computer engineering. The research team has successfully embedded a powerful magnetic memory chip on a flexible plastic material. The device could be a critical component for the design and development of flexible and lightweight devices. The work could find uses in the automotive industry, healthcare electronics, industrial motor control and robotics, industrial power and energy management, as well as military and avionics systems. The new device operates on magneto-resistive random access memory (MRAM), which uses a magnesium oxide based magnetic tunnel junction (MTJ) to store data. MRAM outperforms conventional random access memory (RAM) computer chips in many aspects, including the ability to retain data after a power supply is cut off, high processing speed, and low power consumption.[5]

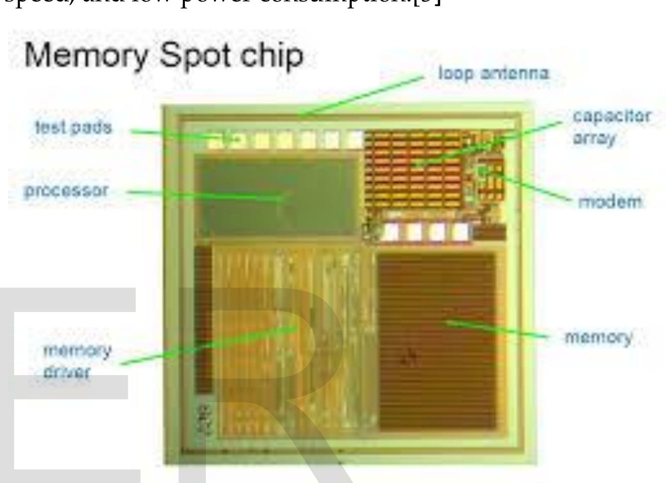


Fig 2: Memory Spot Chip

### 4.1 Volatile memory

Volatile memory is computer storage that only maintains its data while the device is powered. Most RAM (random access memory) used for primary storage in personal computers is volatile memory. RAM is much faster to read from and write to than the other kinds of storage in a computer, such as the hard disk or removable media. However, the data in RAM stays there only while the computer is running; when the computer is shut off, RAM loses its data. Volatile memory contrasts with non-volatile memory, which does not lose content when power is lost. Non-volatile memory has a continuous source of power and does not need to have its memory content periodically refreshed [7].

### 4.2 Non-volatile memory

Non-volatile memory, NVM or non-volatile storage is a type of computer memory that can retrieve stored information even after having been power cycled (turned off and back on). Examples of non-volatile memory include read-only memory, flash memory, ferroelectric RAM (F-RAM), most types of magnetic computer storage devices (e.g. hard disk drives, floppy disks, and magnetic tape), optical discs, and early computer storage methods such as paper tape and punched cards. Non-volatile memory is typically used for the task of secondary storage, or long-term persistent storage.[1] The most widely used form of primary storage today is a volatile form of random access memory (RAM), meaning that when the computer is shut down, anything contained in RAM is lost. However, most forms of non-volatile memory have limitations that make them unsuitable for use as primary storage. Typically, non-volatile memory costs more, provides lower performance, or has worse write endurance than volatile random access memory. Non-volatile data storage can be categorized in electrically addressed systems (read-only memory) and mechanically addressed systems (hard disks, optical disc, magnetic tape, holographic memory, and such). Electrically addressed systems are expensive, but fast, whereas mechanically addressed systems have a low price per bit, but are slow. Non-volatile memory may one day eliminate the need for comparatively slow forms of secondary storage systems, which include hard disks. Several companies are working on developing non-volatile memory systems comparable in speed and capacity to volatile RAM.[8]

## 5 Features of Polymer Memory

1. Data stored by changing the polarization of the polymer between metal lines.
2. Zero transistors per bit of storage.
3. Memory is Nonvolatile.
4. Microsecond initial reads. Write speed faster than NAND and NOR Flash.
5. Simple processing, easy to integrate with other CMOS.
6. No cell standby power or refresh required.
7. Operational temperature between – 40 and 110°C

## 6 Advantages of Plastic memory

1. Plastic memory is fast. Lab built devices with a 1GB storage capacity have yielded read/write cycle times that are 10 times faster than Compact Flash, which are typically 2- 10MB/s read, 1-4MB/s write.
2. Memory is Nonvolatile
3. Fast read and write speeds
4. It requires far fewer transistors, typically only 0.5M (million) for 1GB of storage compared to silicon's 1.5-6.5B (billion).
5. It can be stacked vertically in a product, yielding 3D space usage; silicon chips can only be set beside each other.
6. Very low cost/bit, high capacity per dollar
7. Low power consumption
8. Easy to manufacture: use ink-jet printers to spray liquid-polymer circuits onto a surface
9. Thin Film system requires about 0.5 million transistors per gigabit of memory.

## 7 Limitations of Plastic memory

Turning polymer memory into a commercial product is not an easy process. Memory technologies compete not only on storage capacity but on speed, energy consumption, and reliability. The difficulty is in meeting all the requirements of current silicon memory chips. Until the new memory space is able to compete with the high performance of silicon, their notes, they are likely to be limited to niche applications. One likely use is in disposable electronics, where cost, rather than performance, is the Researchers at Lucent Technologies Bell Laboratories are working on polymer memory devices for use in deciding factor Identification tags. The polymer memory made at Bell Labs is still relatively slow by silicon standards, and anticipated capacity is only on the order of a kilobit. But, says Bell Labs chemist Howard Katz, the flexible and low-cost polymer memory devices could be very attractive• for, say, identification tags meant to be thrown away after a few uses.

## 8 Applications

### 8.1 Radio Frequency Identification (RFID)

A specific point application for low-cost organic devices is the radio frequency identification tag (RFID). These passive systems could be used on commercial products to assist in tracking, inventory control, and theft prevention. RFID chips wants less human manipulation to read, and contain far more data than bar codes. Therefore RFID systems allow tags to be read at a distance, they can expedite in-store check-out, and control warehouse inventory with little human monitoring.

### 8.2 Electronic Map

The flexible nature of the memory is also a valuable attribute that cannot be gained by its silicon counterparts. By combining with electro chromic displays, these memories could be used to make electronic maps on paper or plastic substrates. Unlike GPS systems with expensive handheld devices, these reel-to-reel maps could be folded put into a back pocket, and could be created at such low cost via the reel-to-reel fabrication that they could be entirely disposable.

### 8.3 Medical Application

It can be used in tiny sensors which can work 24 hrs to track BP, heart rate, sugar level.

### 8.4 Defense Application

Think about soldiers in the field who have to carry heavy battery systems, or even civilian ‗road warriors' commuting to meetings. If we had a lighter weight system which operates itself at a lower energy price, and if we

could make it on a flexible polymer display, soldiers and other users could just roll it up and carry it. We
Look this portable technology as a powerful platform for helping people.

### 8.5 Other Application

Particular applications could include active wear with built-in mp3 players. It can also be used in Digital camera for archiving images.

## 9 Conclusion

Plastic memory is much lower and faster than the existing silicon a circuit was invented by Researchers at Princeton Organization working with Hewlett-Packard. Plastic memory is a combination of materials that could lower the cost and power the density of electronic memory. It is an all-organic memory system with manifold advantages: in speed, production, energy consumption, storage ability and cost. The memory cannot be rewritten, but can be read very fast and with low power consumption. So this would be perfect only for permanent storage. Plastic memory uses spin of the electron rather than the charge of electron & spin of electron put into more data compared to the charge. So, large amount of data can be put into in the plastic memory. The plastic memory is flexible compared to the silicon technology. It is thick same a sheet of paper so product size using plastic memory also decreases. The main challenge in developing plastic memory is the polymer for its cover. PEDOT cannot be used for some application like RFID where conductivity need is more. So, alternative polymer is to be used for fabrication. Plastic memory will be very useful for future for storing data.

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