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DEVELOPMENT OF SMART GARMENT WITH MOBILE COMMUNICATION

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Abstract The concept of electro-textile or E-textile has evolved from the concept of wearable computer. A few years ago smart textile were presented as an imaginary products. After scientific efforts and development phases nowadays Smart Fabrics and Interactive Textiles (SFIT) has modified the future of the textile industry. In the near future, textile products including what one wears will transform from their present to multifunctional, adaptive and responsive systems. The functions may include communication, computation and entertainment, as well as health care. Smart Textiles used in non-apparel applications may perform surveillance and detection functions. In this paper, we aim to study the most challenging aspects faced during the production of garment. This paper presents new techniques for attaching electronic to e-textiles: (a) the design of fabric is cotton fibre with conductive wire core form (b) develop a rechargeable mobile garment. This mobile garment will be very useful for communicating messages without any hindrance and this smart garment is used for many more end uses.

Keywords- Cotton, Copper, E-textile, SFIT, Wearable electronics.

I.INTRODUCTION

During the last ten years the traditional textile industry, that during the decades has favoured quality, has changed its strategy to support the innovation and the creation of new products and functionalities. This inversion of situation has allowed the consolidation of the emergence of two areas: “Technical Textiles” and “Smart Textiles.

Smart textiles are defined as textiles that can sense and react to environmental conditions or stimuli from mechanical, thermal, chemical, electrical or magnetic sources. Passive Smart Textiles, which can only sense the environmental conditions or stimulus. Active Smart Textiles are second generation has both actuators and sensors. The actuators act upon the detected signal either directly or from a central control unit. ActiveSmart textiles are shape memory, chameleonic, water-resistant and vapour permeable (hydrophilic/non porous), heat storage, thermo regulated, vapour absorbing, heat evolving fabric and electrically heated suits.

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Ultra Smart Textiles are the third generation of smart textiles, which can sense, react and adopt themselves to environmental conditions or stimuli. Basically, 5 functions can be

- Sensors
- Date processing
- Actuators
- Storage
- Communication

II. LITERATURE SURVEY

2.1. Wearable electronics

- Fashion designers are adding wires, circuits, and optical fibers to traditional textiles, creating garments that glow in the dark or keep the wearer warm.
- Electronics engineers are sewing conductive threads and sensors into body suits that map users' whereabouts and respond to environmental stimuli.
- It is possible to integrate properties of sensitivity, information and intelligence into single materials.
- Electronics is the science and technology related to the generation, transmission, Modulation and detection of electrons and photons.
- A wearable electronic is clothing that has the above functions, is always attached to a person and is comfortable and easy to keep and use.

2.2.Electronics and Clothes: Wear in and Wear out

The intersection of textiles, clothes and electronics offers the possibility of radial new products. We can envisage clothes that dynamically change colour, or garments that unobtrusively monitor your physiological state, or clothes that become a second skin enhancing how you sense the world about you. But how far away are these fine visions? What can we do today and where should we head tomorrow? Conductive fibres are the principal breakthrough that is enabling textile electronics to get off the ground. These fibres; using either silver, stainless steel or carbon in various forms enable those of an electronics disposition to start to think in terms of soft, drape able electronics; rather than the usual hard forms. Of course to a degree a conductive fibre is a wire, and wires are often not considered exciting when compared to the transistors, diodes, and a myriad of IC's that one can normally call upon.However, that is to under estimate the ingenuity of those in this field, from conductive fibres we have seen components such as:

- Fabricantennas
- Sensorsthat can measurestretch
- Fabric data and powerbusses
- Fabric electrodes for measuring heart-rate and respiration sensor

Beyond conductive fibres there are other technologies starting to have an impact in wearable, such as polymer electronics which enable soft keypads, strain-sensing and hold out the future promise of actuating fibres. As regards light and displays the options are still rudimentary but electroluminescent wires, fibre optics, thermo

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chromic materials and LED's are being used, or at least experimented with. With the vast amount of research focussed on flexible displays it is likely to only be a matter of time before we see the combination of these and garments.

Of course below the surface is the rather issue of garment wear and care. Although weoften talk about caring for our garments what we really do is immerse them in a hot chemical bath and subsequently dry them at high temperatures. Clearly, one has to be cruel to be kind! However, such treatment is rather frightening to anyone who values the operation of his or her electrical equipment. Ensuring that textile electronics survives the cleaning process is really only just being investigated. Taking out sensitive electrical objects before cleaning is the main line of defence but sealing of electronics is also a possibility.

A toolkit of components is slowly being assembled. Quite what will be the successful applications, long term, no one really knows. Consequently, what we see happening is a great deal of experimentation, both in applications but also in mixing disciplines, which is all quite refreshing, and what makes this an interesting and pioneering area to work in. Progress is being made in the areas of sports, fashion, medical, military and work wear domains but numbers are presently small. In all likelihood it will take a number of applications, were wearable provides the only viable solution to see it grow. With such well-defined uncertainties it is a good time to assemble a network and generate some collaborative exploration.

2.3. Communications

Mobile communication has become an integral component of people's lives. The three objects that were always sought when leaving home, namely keys, wallet and watch, have now become keys, wallet and mobile. It has reached this lofty position in people's lives through satisfying people's need for communication, but offers many other possibilities as its performance and functionality have grown.

Indeed, it could be argued that the mobile has become the first truly ubiquitous and pervasive wearable computer, supporting many of the functions that people currently use their PCs for. From a technical perspective, the mobile supports both voice and always-on data channels over long distance, and also short range ad-hoc communication via Bluetooth. From an individual's perspective, the ability to communicate with anyone or anything, anywhere and anytime holds tremendous value, whilst new communicative practices emerging through the use of short range messaging are creating new instances of pleasure and pain for people. The device itself is also becoming more powerful, especially now that a Java execution environment is nearly always present. In this light, it provides an interesting alternative to the more usual devices cited when considering applications for wearable computing, especially when many of the headaches associated with battery life and communication are largely solved. With regards to incorporating the mobile into fabric and textiles, the development of small, light Bluetooth communication modules now allows the required bulky components of

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wearable computing such as battery, processor and storage to be offloaded and hidden away. In this way, only the local, small-scale requirements of supporting the Bluetooth module need to be incorporated into the wearable.

This clearly has the benefit of reducing production costs, and will make wearable devices more affordable. Finally, as the processing power of mobile devices increase, so more parallel applications can be supported, such that the number of wearable devices worn or carried at any given time can increase.

Thus we can imagine a future where a number of dedicated function devices create the wearable computing experience for the user, and where the innate functionality of each object is appropriately augmented to provide a more natural experience.

III. MATERIALS

Smart garment formed from a combination of typical non – conduction textile fibre and electro conductive copper wires to produce core yarn.

3.1. Characteristics of Cotton

3.1.1 Aesthetics

Cotton's aesthetics vary depending on the applied treatments, the fiber blend (if blended) and the grade of the fiber. A typical 100% untreated cotton fabric has a pleasant matte luster, a soft drape and a smooth hand.

3.1.2 Comfort

Cotton fabrics are very comfortable to wear due to their soft hand and other characteristics. Cotton fabrics have excellent absorbing capabilities. Cotton garments absorb perspiration, thus keeping the person more comfortable.

3.1.3 Appearance Retention

Cotton wrinkles very easily. However, there are many cotton garments on the market that have been treated with wrinkle resistant finishes. These finishes reduce the need to iron cotton clothes. Consequently, our fast paced society can look good in cotton garments without investing a lot of time in preparing them.

3.1.4 Care

Always read the care label in the product. Cotton products can typically be machine washed and dried. Colored cotton garments retain their color longer if they are washed in warm or cool water. Cotton fabrics can be bleached but too much bleaching could weaken the fibers.

Acids harm cotton fabrics; consequently, juice stains should be treated immediately with cold water. Sunlight does harm cotton by causing it to oxidize and turn yellow. Fabrics that are 100% cotton do shrink if they have not been treated with a durable-press or a shrinkage-resistant finish

3.2. Properties of Copper

3.2.1 Atomic Properties

Copper is in column IB of the Periodic Table of the Elements, above Silver (Ag) and Gold (Au). Elements in the same column have some similar

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properties. Like silver and gold, copper is soft (with a Moh's hardness of 2.5 to 3, that is, harder than a fingernail, but softer than a steel pocketknife).

The surface has a metallic luster. With a specific gravity of 8.2 (based on the density of 8.2 grams per cubic centimeters, g/cm3), it is far denser than water with a specific gravity of 1, or sulfur, with a specific gravity of just over 2, or carbon in the mineral graphite (2.23). Silver, however, is below copper in column IB, and so it is denser (10.5) and gold, even lower, is far denser at 19.

When Copper combines with other elements, it has a charge of either +1 (called "cuprous") or +2 (called "cupric").

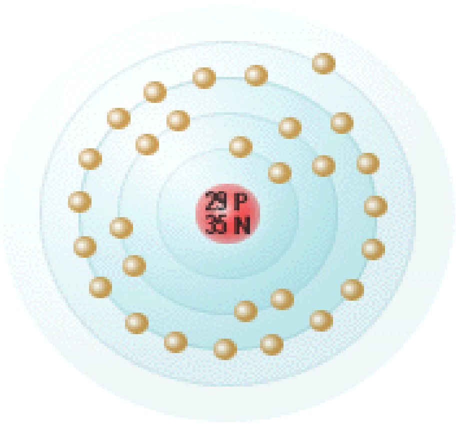

Fig 3.2.1 Atomic structure

3.2.2 Physical Properties

Like gold, silver, copper is malleable. That is, it can be bent and shaped without cracking, when either hot or cold. It can be rolled into sheets as thin as 1/500 of an inch.

Copper also is ductile, that is, it can be drawn out into thin wire. A copper bar 4 inches thick can be heated, rolled, then drawn into a round wire so thin that it is thinner than a human hair. This wire is 20 million times longer than the original bar! Industry valued copper for these properties.

Copper is second only to silver in its ability to conduct electricity, but silver is too expensive for this sort of use. Bronze and brass, however, do not conduct electricity as well as pure copper. Besides electricity, copper also is an excellent conductor of heat, making it an important metal in cookware, refrigerators, and radiators.

Copper is resistant to corrosion, that is, it will not rust. If the air around it often is damp, it will change from its usual reddish orange color to reddish-brown. Eventually, it is coated with a green film called a "patina" that stops all further corrosion.

The melting point of copper is 1083.4 degrees Centigrade. Liquid copper boils at 2567 degrees Centigrade.

3.2.3 Copper for this smart fabric

There are two strategies to create electrical or thermal conductive fabrics and two types of materials, the metals and the polymers.

The same materials could be used for the both conductivity (thermal and electric), because the

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two processes are similar and results of an electronic agitation/conduction.

The first strategy uses high wicking finishes (ink) with a high metallic content that still retains the comfort required for clothing.

With the addition of nickel, copper, silver or carbon coatings of varying thickness, these finishes provide a versatile combination of physical and electrical properties for a variety of demanding applications.

The second strategy consists in the direct use of conductive yarns. The yarn could constitute metal such as silver and copper. Although there are many different trademarks commercialising these materials, they all have the same main properties.

They are lightweight, durable, and flexible and cost competitive and they are able to be crimped and soldered and subjected to textile processing without any problems.

IV. METHODOLOGY

Process chart: Single core yarn

↓

Weaving done by loom

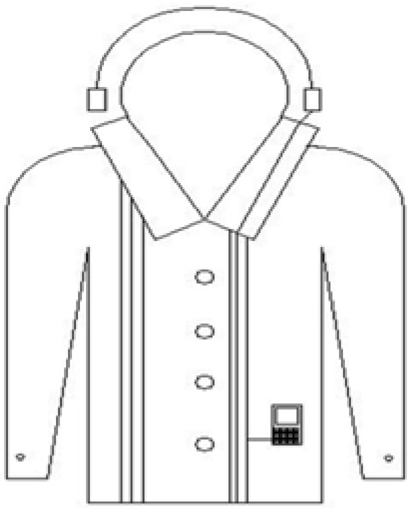
↓

Cloth stitched as a garment

↓

Mobile attached

PROJECTDRAWING



V. RESULTS

5.1. FABRIC – TENSILE STRENGTH

Warp strength	58.82kg
Warp elongation	19.40%
Weft strength	63.44kg
Weft elongation	15.20%

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5.2. FABRIC – AIR PERMEABILITY

Air permeability - 68.3 c.c/cm.sq.sec

5.3. THERMAL RESISTANCE

Mean value	0.0166sq.m k/watt

VI. CONCLUSION

We concluded that through this MOBILE SHIRT to communicate all type of incoming and outgoing messages to various places. Especially we will use this shirt for Army, police etc., for communicating the secret and confidential matters whenever necessary. No electrical shock or side effect to the body because core yarn is used as it is produces only low volts power and it is rechargeable.

Secondly there is no different between this mobile shirt and other ordinary shirt because comfortable for wearing any season as we are using materials. We will recharge this mobile through the solar power and human body power. However this rechargeable power will not be retained for a long time. Hence we shall use a 6 volt rechargeable battery.

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