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"NETWORK OF MICRO ELECTRO MECHANICAL SENSOR"

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ABSTRACT

Micro Electro Mechanical Systems (MEMS) is an enabling technology for the Internet of Things (IoT) because MEMS manufacturing makes possible small, low-cost, high-performance sensors and actuators. This chapter discusses some of useful and valuable aspects of MEMS technology for the IoT. While human senses have evolved to be quite good at specific functional capabilities, they are very limited compared to MEMS sensor technologies. MEMS sensors can have sensitivities far higher than any human, or even some animals, thereby enabling the ability to detect far smaller levels of an olfactory parameter, or any other parameter, than otherwise would be possible.

1. INTRODUCTION

This report deals with the emerging field of micro- electro mechanical sensors, or MEMS. MEMS is a process technology used to create tiny integrated devices or systems that combine mechanical and electrical components. They are fabricated using integrated circuit (IC) batch processing techniques and can range in size from a few micrometers to millimetres. These devices (or systems) have the ability to sense, control and actuate on the micro scale, and generate effects on the macro scale.The interdisciplinary nature of MEMS utilizes design, engineering and manufacturing expertise from a wide and diverse range of technical areas including integrated circuit fabrication technology, mechanical engineering, materials science, electrical engineering, chemistry and chemical engineering, as well as fluid engineering, optics, instrumentation and packaging. The complexity of MEMS is also shown in the extensive range of markets and applications that incorporate MEMS devices. MEMS can be found in systems ranging across automotive, medical, electronic, communication and defence applications. Current MEMS devices include accelero meters for airbag sensors, ink jet printer heads, computer disk drive read/write heads, projection display chips, blood pressure sensors, optical switches, Micro valves, biosensors and many other products that are all manufactured and shipped in high commercial volumes. MEMS has been identified as one of the most promising technologies for the 21st Century and has the potential to revolutionize both industrial and consumer products by combining silicon based micro electronics with micro machining technology. Its techniques and micro system based devices have the potential to dramatically affect of all of our lives and the way we live. If semiconductor micro fabrication was seen to be the first micro manufacturing revolution. MEMS is the second revolution. This report introduces the field of MEMS and is divided into four main sections. In the first section, the reader is introduced to MEMS, its definitions, history, current and potential applications, as well as the state of the MEMS market and issues concerning miniaturization.

2. TECHNOLOGY

Using the micro machining method, various layers of polysilicon, typically 1-100 mm thick, are deposited to form a three-dimensional structure having metal conductors, mirrors, and insulation layers. A precise etching process selectively removes an underlining film (sacrificial layer) leaving an overlaying film referred to as the structural layer capable of mechanical movement.

Surface micro machining is used to manufacture a variety of MEMS devices in commercial volumes. Layers of polysilicon and metal can be seen before and after the etching process.

Bulk micro machining is another widely used process to form functional components for MEMS. A single silicon crystal is patterned and shaped to form high-precision three-dimensional parts like channels, gears, membranes, nozzles.

Figure 1 : MICRO TECHNOLOGY

This technology is currently available through Multi-Circuit Projects. In this technique, post-process operates as an isotropic silicon etching that uses the various silicon oxide layers as natural mask.

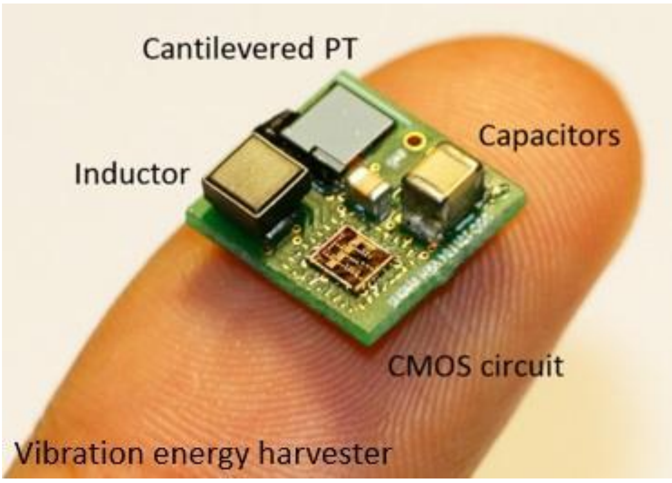

Fig 2: SENSING TECHNOLOGY

The technique consists in allowing, during the VLSI process, to superimpose passivation, via and contact dielectric openings above a substrate area. If these openings are realized above an area free of interconnect layers (first and second metal or polysilicon), the h100isubstrate planes can be etched using EDP (Ethylene Diamine Pyro catechol) or TMAHW (Tetra Methyl Am -monium Hydroxide and Water) solutions, leaving theh111i planes of the silicon substrate. Suspended struc-tures such as cantilever beams, bridges or membranes are then obtained. The sensing capability of such a de-vice comes from the piezo resistivity of the poly siliconlayer. If a polysilicon gauge is located in a suspended structure, resistance variations can be used to monitor forces and stresses applied to the structure. The conversion element converts the detected signal from the sensing element into an electrical signal suitable for transmission or measurement. Finally, the input converter circuit will process the electrical signal accordingly.

The invention and use of sensors are an important link in the new tech-nology revolution. Therefore, sensor technology is also known as one of the three pillars of information tech-nology and an important technology connecting the physical world with the computer world. information is transmitted in a fixed form, and in electromechanical automation system it is mainly transmitted in the form of current or voltage, so it may be affected by various factors inside and out-side the system.

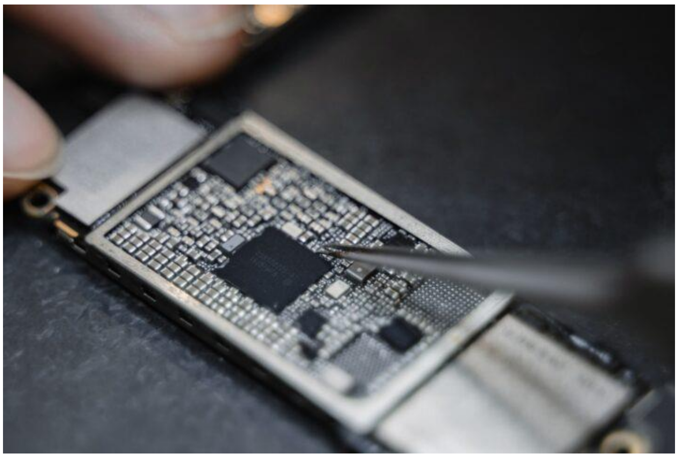

Fig 3: intelligent of detection of micro sensor

Intelligent sensors are vastly used in many different applications. Sensor technology also has become a requisite enabling technology in many applications. The fast growth in the interest in sensors has been supported by numerous applications, such as intelligent fabrication processing in which intelligent sensors can provide great advantages. Also, intelligent sensors are of great significance in safety-related areas with appreciated applications ranging from safety assessment of aircraft to environmental monitoring for hazardous chemicals

3. ADVANTAGES

- Extremely scalable in manufacturing, resulting in very low unit costs when mass-produced
- MEMS sensors possess extremely high sensitivity
- MEMS switches and actuators can attain very high frequencies
- MEMS devices require very low power consumption
- MEMS can be readily integrated with microelectronics to achieve embedded mechatronic systems

4. APPLICATIONS

- It provides better and efficient security.
- Redesigns of DES may make them more amenable to also including cameras and facial recognition software, more so than They would be in regards to retrofitting pre-existing machines.
- It avoids fraudulent attempts through sensors networks, badly-chosen or automatically assigned PINs, networks with little or no encryption schemes.
- Employees with access to non-encrypted customer account information and other points of failure and also avoid the unauthentic share.

5. CONCLUSION

The work summarized in this paper has provided convincing proof that high-performance flexible and stretchable MEMS devices can be constructed using appropriate strategies. Fabrication processes include transfer printing, shaped electrical connection, and heterogeneous integration using diverse classes of inorganic material-based MEMS structures and flexible substrates (plastics, elastomers, and others). The flexible MEMS devices reviewed here include, among others, MUTs, pressure sensors, strain sensors, and resonators. Various disciplines, ranging from mechanical engineering, electrical engineering, and chemistry to materials science, have been involved in efforts to realize flexible MEMS sensors and systems.

REFERENCES

[1] Abshirini M, Charara M, Liu Y, Saha M, Altan MC. 3D printing of highly stretchable strain sensors based on carbon nanotube nano composites. Advanced Engineering Materials. 2018;20:1800425

[2] Jung YH, Park B, Kim JU, Kim TI. Bio inspired electronics for artificial sensory systems. Advanced Materials. 2018:e1803637

[3] Sun Y, Yang L, Xia K, Liu H, Han D, Zhang Y, et al. "Snowing" graphene using microwave ovens. Advanced materials. 2018;30:e1803189

[4] Park M, Bok BG, Ahn JH, Kim MS. Recent advances in tactile sensing technology. Micromachines (Basel). 2018;9:321

[5] Schroeder V, Savagatrup S, He M, Lin S, Swager TM. Carbon nanotube chemical sensors. Chemical Reviews. 2019;119:599

[6] Maity D, Kumar RTR. Polyaniline anchored MWCNTs on fabric for high performance wearable ammonia sensor. ACS Sens. 2018;3:1822

[7] Amjadi M, Kyung K-U, Park I, Sitti M. Stretchable, skin - mountable, and wearable strain sensors and their potential applications: A review. Advanced Functional Materials. 2016;26:1678

[8] Yang T, Xie D, Li Z, Zhu H. Recent advances in wearable tactile sensors: Materials, sensing mechanisms, and device performance. Materials Science and Engineering. 2017;115:1