International Journal of Electrical and Electronics Engineers
Vol. No.7 Issue 02, July-December 2015
www.arresearchpublication.com
IJEEE
ISSN 2321 - 2055

FORTHCOMING POWER GENERATION TECHNOLOGY – BY MULTIFERROICS ALLOYS

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ABSTRACT

World has been constantly struggling with the energy problems. Scientists are searching for new economic, clean ,renewable and efficient sources of energy. Despite of all the expensive and tremendous research, we are unable to find any reliable energy resource which will satisfy all our needs.

Keywords*: *Renewable, Reliable, Clean, Economic

Aim: To fabricate a multiferroic alloy that converts waste heat into electricity.

I. INTRODUCTION

We demonstrate a new method for the direct conversion of heat to electricity using the recently discovered multiferroic alloy, **Ni45Co5Mn40Sn10.** This alloy undergoes a low hysteresis, reversible martensitic phase transformation from a nonmagnetic martensite phase to a strongly ferromagnetic austenite phase upon heating. When biased by a suitably placed permanent magnet, heating through the phase transformation causes a sudden increase of the magnetic moment to a large value. As a consequence of Faraday's law of induction, this drives a current in a surrounding circuit. Theory predicts. that under optimal conditions the performance compares favorably with the best thermoelectrics. Because of the low hysteresis of the alloy, a promising area of application of this concept appears to be energy conversion at small T, suggesting a possible route to the conversion of the vast amounts of energy stored on earth at small temperature difference.

II. PROPERTIES OF MULTIFERROIC DOMAINS

In contrast to materials with a single ferroic order, domains in multiferroics have additional properties and functionalities. For instance, they are characterized by an assembly of at least two order parameters. The order parameters may be independent or coupled Many outstanding properties that distinguish domains in multiferroics from those in materials with a single ferroic order are consequences of the coupling between the order parameters.

- The coupling can lead to patterns with a distribution and topology of domains that is exclusive to multiferroics.
- The order-parameter coupling is usually homogeneous across a domain, that is, gradient effects are negligible.
- In some cases the averaged net value of the order parameter for a domain pattern is more relevant for the coupling than the value of the order parameter of an individual domain.

III. FABRICATION OF MATERIAL

To create the material, we have to combine elements at the atomic level to create a new multiferroic alloy, Ni45Co5Mn40Sn10. Multiferroic materials combine unusual elastic, magnetic and electric properties. The alloy Ni45Co5Mn40Sn10 achieves multiferroism by undergoing a highly reversible phase transformation where one solid turns into another solid. During this phase transformation the alloy undergoes changes in its magnetic properties that are exploited in the energy conversion device During a small-scale demonstration we begined as a non-magnetic material, then suddenly becomes strongly magnetic when the temperature is raised a small amount. When this happens, the material absorbs heat and spontaneously produces electricity in a surrounding coil. Some of this heat energy is lost in a process called hysteresis.

Ni45Co5Mn40Sn10 ---- 100%

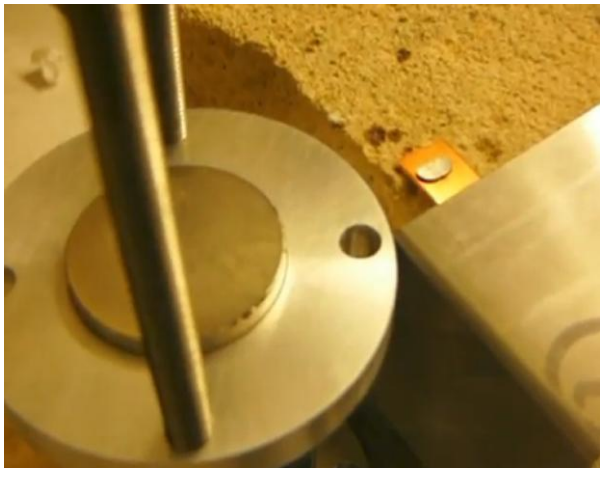
Elements	**Percentage**	**Weight (gms)**	**Molecular weight**	**Actual weight (gms)**
Nickel	45%	0.45	58.9634	2.641
Cobalt	5%	0.05	58.933	0.29465
Manganese	40%	0.40	54.938	2.1975
Tin	10%	0.10	118.71	1.187

Note: the percentage of elements taken should be accurate, even a small change in percentage can affect magnetization value of the whole material.

IV. TESTS TAKEN AFTER THE FABRICATION OF MATERIAL:

- **XRD studies** – In order to confirm the presence of element.
- **SEM** – for morphology and structural analysis
- **EDAX** – percentage analysis
- **VSM squid** – which is final analysis for checking the magnetic hysteresis

V. PICTURE OF ALLOY PELLET



VI. PRESENT SCENARIO

if we consider a magnet or an electromagnet, the properties are unique and cannot be altered. For example: if we heat a magnet, it becomes demagnetized and when we cool the magnet it becomes magnetized.

VII. FUTURE POSSIBILITIES

we can reverse the above idea to get more useful possible outcomes. For instance the small amount of heat emitted or exhaled by many natural and artificial can be converted into electricity by reversing this idea.

VIII. APPLICATION

Using a multiferroic alloy of nickel, cobalt, manganese, and tin there is a method of creating green electricity from waste heat sources

- If this can be installed in transmission lines it will be great way to reduce the transmission loss
- This alloy could be placed near your car's exhaust to create electricity
- The waste heat emitted from cooling towers of power stations can be converted into electricity
- Other modes of waste heat can be converted.

IX. FUTURE GADGETS

- **Doubling the charging in laptops --B**y making a gadget having multiferroic alloys. Since a lot amount of heat is released from laptops, frequently while using laptop there is a gadget fixed to the heat emitting part which in turn converts heat energy into electricity which can be stored in batteries. when laptop batteries are completely drained, they can be again recharged successfully.
- **Additional power generation in transmission lines** – The ACSR (aluminum conductor steel reinforced) cables are used in power transmission lines, considering the galvanized steel wire part, which is present at the central position can be replaced by multiferroic alloys. Which reduce the transmission losses by acting as conductor as well as transducer. It can improvise efficiency of the transmission lines.

X. PICTURE OF ACSR CABLES

XI. END RESULT

The magnetization obtained from alloy material is **1.17*10^6 A/m**

XII. CONCLUSION

Thus we conclude that future extension of conductors can be constructed and used to conduct electricity with less transmission loss and other gadgets can also be developed for conversion of waste heat into electricity

XIII. ACKNOWLEDGEMENT

We acknowledge the faculties Mr.Krishna Sharma MSc, MPhil,(Ph.D), and Ms.Athista M.A., M.Phil., B.Ed., PGCTE, PGDTE. and other staffs who supported with me for this research.

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