ISSN (Online) 2395-2717
International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE) Vol 2, Issue 6, June 2016

The SCALABALITY of NANOFIBRES in Energy Stratum

[1]Prof.Malini K V, [2] Ms. R. Gunasekari, [3]Yeshwanth [4]Mohan Kumar
[1]Assistant Professor, [2] Associate Professor & Head, [3][4]UG Scholar
[1][2][3][4] Department of EEE,
Sri Sairam College Of Engineering
Affiliated to VTU, Anekal, Bengaluru- 562 106

Abstract: **- Today the major challenge in the technological field is of the provision of energy which is the key factor for the automation and development of the country. The usage of the fossil fuel based energy and the conventional sources to be minimized and a greater emphasis is on harnessing the renewable energy which is abundantly available in the nature. This transition requires the technology and adaptation. Hence improving the energy intensity and per capita consumption drives the economy of the country thereby making the country green. The increase in the energy efficiency reflects the nation's economy. The gap in the demand and supply is creating a pressure on reducing the energy consumption in one of the sectors like transportation which accounts to 20% of the world's total primary energy consumption and produces much of the world's population.**

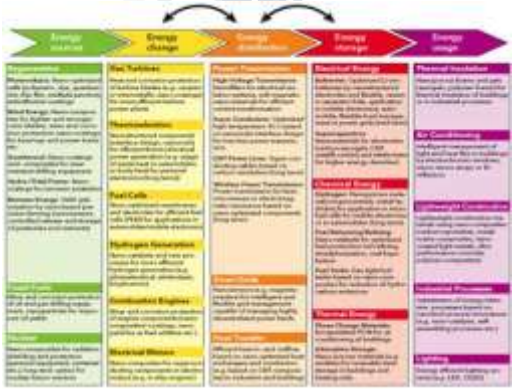
The provision of nano technology in industry provides increased production efficiencies and in renewable energy sector it balances the usage of the sources. The chain of energy sector is benefitted with the application of inventions in nano technology. The various benefits are observed from the application of nanotechnology based products and each part of the energy chain.

Basically, Nanotechnology is the creation of useful materials, devices and systems of any size .The nano scale materials exhibits unique mechanical, electronic, photonic and magnetic properties. This results in the applications of nano materials in the development of energy sources , conversion of energy, transmission and distribution of energy, energy storage and energy usage.

Keywords: **Energy, Nanoscale materials, nanotechnology, renewable energy, applications**

I. INTRODUCTION

Today the application of nanotechnologies in the energy related areas promises the increased efficiency and occupation of less space. The prime advantage is in the product design with this enhanced efficiency and compact size. The study of these opportunities in energy sector opens up a new opportunity towards nano sizing the products.



Examples for applications of nano science in energy sector

II. ENERGY SOURCES

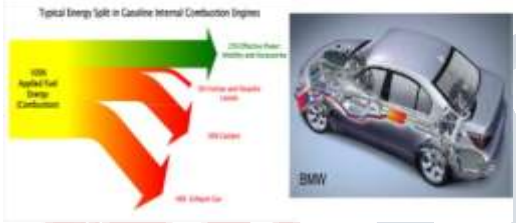
With the increasing demand globally, there is an equal pressure on reducing the CO_2 emission considerably. Thus, the Nanoscience & Technology contributes towards the essential improvement potential for the development of both fossil and nuclear fuels. It also provides essential improvement of renewable energy sources like solar, wind, geothermal, tidal and biomass. Although light materials like aluminium and magnesium replaceable for steel in the production of electrical parts they exhibit low strength against the mechanical stresses. Nano sized ceramic materials incorporated into light metals modify the physical properties and hence proposed for the production of bearings, rotor blades of the motors in wind and tidal power plants. It also provides protection against corrosion and wear and tear for the mechanically stressed components. The conventional solar PV cells faces the problem with fast energy loss by hot carriers. The use of nanocrystals with different band gap values or quantum confined nanocrystals could offer a solution by capturing the full solar spectrum. Thus the energy loss is minimized. The application can be extended solar –photocalysis which can be a proven choice in separating hydrogen from solar water splitting where TiO_2 nanoparticles are used in water

ISSN (Online) 2395-2717
International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE) Vol 2, Issue 6, June 2016.

splitting. This approach is very interesting as it not only reduces the carbon footprint but also in terms of sustainable transportation using the existing infrastructure for fuel distribution.

III. ENERGY TRANSFORMATIONS

Nano materials coating can improve the efficiency of the turbine blades as they provide protection against heat and corrosion. The coal-fired power plants shall become environmentally friendly with this method as Nano-optimized chambers provide ultimate filtering of CO_2 . The energy yield from the conversion of chemical energy through fuel cells can be optimized by replacing the Pt catalysts through nano material. This provides a solution to make fuel cells commercially viable with its operative costs. This opens up a new opportunity for the application of fuel cells in automobiles, buildings and the mobile electronics. The optimized boundary layer design of the nano structured semiconductors can be employed in utilization of waste heat in automotive industries, textile industries and illumination industries.



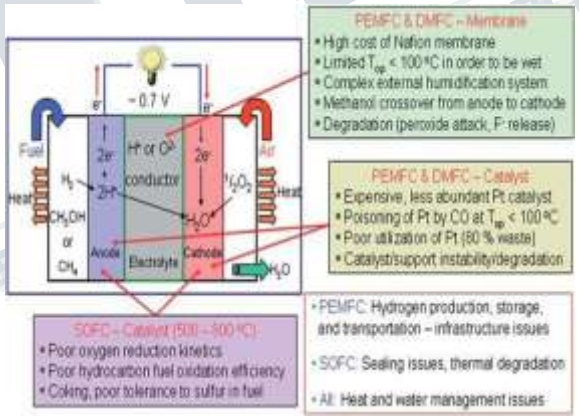
IV. TRANSMISSION AND DISTRIBUTION LOSSES

The transmission and distribution losses can be appreciably minimized with the application of carbon nano tubes and in power cables and conductor lines. The nano composite materials save weight and offer great performance contributing to the reduction of green house gases. The nanotechnological approaches developed towards lossless current conduction materials by optimizing the superconductive materials in transmission of power. The wireless transmission through electromagnetic resonance,laser and microwaves eventually proving efficient in terms of energy transport . Nanotechnologies effectively contributes well to next gen technology through nano sensory devices and power electronically components with high complexity management of grids.

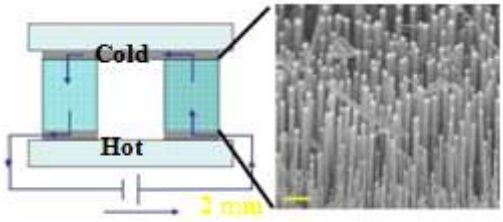
Considerable progress has been made in the development of nanomaterials ,high temperature superconductors in the last years which significantly extended the processeability and applicability of this material class. Superconductors play a vital role in the low-loss wired technology, in coil windings and bearings of electric engines, high current circuit breakers and relays in high voltage grids. The properties like high permeability and temperature stability are most important for transformers. This can be achieved by iron-based alloys and mostly suitable in energy related applications like low-loss transformers, electronic energy and power electronic components. For high power lines the nano insulation materials reduces the risk and increases efficiency. The mechanical strain and electrical stresses reduces the efficiency of the lines. This can be well addressed by nanoscale materials which are multifunctional and adjusts its mechanical, thermal and electrical properties according to power demand.

V. ENERGY STORAGE

The most promising areas of energy storage in batteries and super capacitors with the application of nano materials Due to the high voltage and power density the lithium-ion technology has proven to be the most promising power variant of electrical energy storage. The nano technology through new ceramic, heat-persistent and has flexible separators and high performance electrode materials. The commercialization of such materials provides development potentials of fuel cells.



In the long run, the important field of storage is thethermal energy storage. Significantly, the energy demand buildings can be reduced by latent heat storages. These storages can be set up by phase changing materials. Interestingly, nano porous materials like Zeolite absorbs heat .The absorption of water releases heat allows the reverse storage.

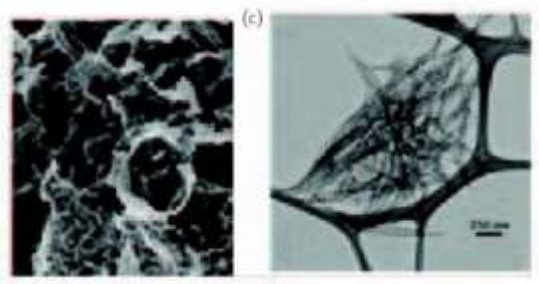


2 mm

ISSN (Online) 2395-2717
International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE) Vol 2, Issue 6, June 2016.

VI. REPLACE CONVENTIONAL MATERIALS BY NANOCOMPOSITE MATERIALS

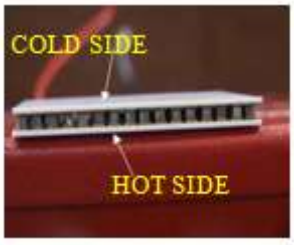
In the long run even hydrogen seems to be promising energy store which is environmentally friendly.



Catalytic nanostructured hydrogen storage materials are characterized by Mass transport, heat transfer, multidynamics and multiscale operations.

VII. ENERGY USAGE

It is necessary to minimize the wastages and optimize the resources. This applies to all industries, households and all commercial sectors. Nanoscience provides a multiple approach to energy saving. Nanotechnology promises an increased efficiency in lighting, refrigeration, auto components and a large variety of sectors. The usage of nano particles in fuel increases the combustion efficiency, usage of nano particle improves rolling resistance, lightweight materials ensures lighter engine components, wear resistant properties and so on. The solid state lighting, LEDs holds a promise in efficient, power saving and a longer life in lighting industry. With the use of nano composite materials the thermoelectric properties can be enhanced.



The power generation basically dependant on seebeck effect. With the experiments conducted the ZT=3, proved an efficiency of conversion 17%. The challenge is in maintaining the electron transport while maintaining the phonon heat conduction. Building technology also provides a greater opportunity to energy savings which could be tapped. The energy rehabilitation of the old buildings can be done by nanoporous thermal insulation materials. In general control light and heat can be realized by using the switchable glasses.

VIII. CONCLUSION

In view Of the growing energy demand the nano materials are a promising one in the field of generation, transmission and distribution ,utilization of conventional and renewable energy resources effectively. This reduces the carbon footprint successfully reducing the risks of CO_2 emissions appreciably. Growing efficiency and demand side management, knowhow of nanotechnological approach may play a key role required for innovative methods in energy sector. Nano technological methods provide potentials for more different approach in terms of maintaining the resources and developing the non conventional ones. The design of the new gen system requires long-term investments and careful adaption after the long time assessment in the market. In case of solar and wind power generation which are dilute in nature the power generation and supply should be ensured with the intermediate energy banks as buffers to balance the fluctuating demand.

While considering the renewable sources, or while replacing the fossil fuels the functional usage as energy bank as well as source should be taken in to account. The move into hydrogen technology and other bio fuels may be treated as next gen vision which requires a big leap in terms of investments and technology. Further challenges of energy sector are the integration of mobile energy banks with the wireless transmission of power. The development and utilization of nano technological innovations in a broader sector like energy sector needs to address the broader spectrum of other nodal branches involving all the players in between. This would bring in a sustainable, economical and a green movement in scalable proportion in energy sector.

REFERENCES

[1] NanoTechnology applications in energy Sector Volume 9/ Aktionsline Hessen

[2] www.hessen-nanotech.de

[3]http://www.sciencedaily.com/releases/2011/06/110615080217.htm

[4]http://www.hessen-nanotech.de/mm/NanoEnergy_web.pdf

[5]http://www.nature.com/nnano/journal/v7/n10/full/nnano.2012.179.html

[6]http://www.nanowerk.com/nanotechnology-in-energy.php