

Electricity from Solar Rays Using Honeycomb Lens and Nano-Particled Solar Panels

Uma Shankar S¹, Dhanush Narayanan R², Arun G³, Sivakumar G⁴

U.G. Student, Department of Mechanical Engineering, Panimalar Engineering College, Poonamallee, Chennai, India^{1,2,3}

Professor, Department of Mechanical Engineering, Panimalar Engineering College, Poonamallee, Chennai, India⁴

ABSTRACT: In this study, the vapour of liquid ammonia and water mixture is produced by heating with the help of honeycomb lenses which concentrates the solar power. The vapour produced is to run a turbine which runs a generator and produces electricity. The vapour is then cooled down and reused again. In addition to that a nanoparticle present solar panel is used to produce even more electricity.

KEYWORDS: Liquid ammonia mixture, honeycomb lenses, turbine, generator, solar power, nanoparticle, solar panel.

I. INTRODUCTION

The energy demand in the world is expected to increase continuously. The non-renewable resources are depleting and a need for alternate energy is needed, which needs to produce a sufficiently great amount of electricity, which is still in the developmental stage. Therefore one of the alternatives ways is to use renewable energy, which is still present more in quantity. Sun is one of the dominant renewable energy in our world. We know that because of sun rays photosynthesis occurs and plants grow. Then we eat the plants to live a balanced life. Here we are use a converted sunlight energy form for our own energy requirement.

In this research paper, we have a described an efficient way on how to produce electricity using the solar rays. The solar thermal energy is increased by a honeycomb [1] lens and used to produce a vapour of liquid ammonia which runs a turbine-generator and producing current.

II. EXPERIMENTAL METHOD AND DISCUSSION

The working fluid in the main tank is heated with honeycomb lenses by converging solar rays [2]. Then the working fluid is converted into vapours of working fluid. It then passes through the compressor which increases the pressure. The high pressure vapour then strikes the turbine and runs it. Thus producing electricity for our daily consumption. Then the hot vapour is cooled by a heat exchanger and then stored in a tank. The process is repeated how many time ever needed. In addition to that additional nanoparticle solar panels which produces energy for running pump, compressor and any external unit.

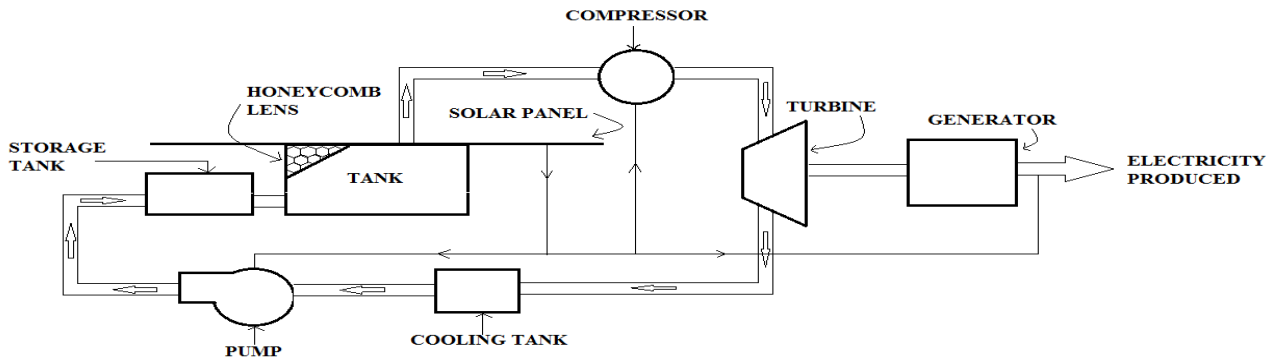


Fig 1:Proposed Experimental Setup.

2.1. HONEYCOMB LENSES

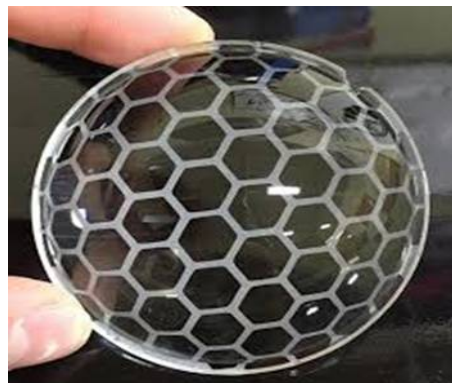


Fig 2: Honeycomb lens

These are hexagonal structured convex lenses. It is used to increase the power of solar thermal rays when the convex lens converges the sun light by the structure of graphene (a carbon allotrope), it has a honeycomb structure [3]. These lenses can approximately increase the temperature of working fluid by a difference of 40'c with the initial temperature. As the number of lenses increase even the amount of heat produced also increases.

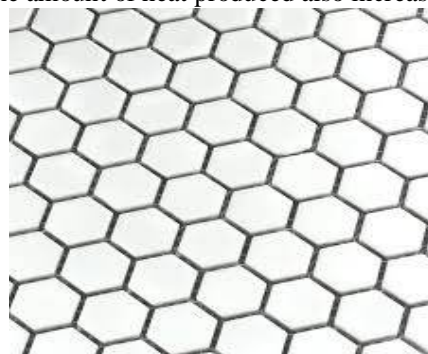


Fig3: Hexagonal shaped honeycomb

No of lenses is proportional to amount of heat produced.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 3, March 2017

2.2. COMPRESSOR

A compressor is used to increase the pressure of vapour by reducing its volume. It has a rotating compressor coupled to a turbine.

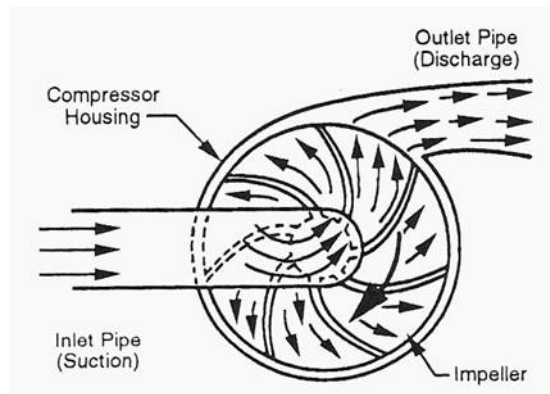


Fig 4: Compressor

2.3. TURBO GENERATOR

A turbo generator is the combination of a turbine directly connected to an electric generator for the generation of electric power. Here the vapour pushes the turbine to rotate which produces a rotary motion in turbine also rotating the generator. The generator works based on the principle that whenever a conductor cuts the magnetic field, an emf is induced which will cause the current to flow if the conductor circuit is closed. Thus producing electricity when required.

2.4. COOLING TANK

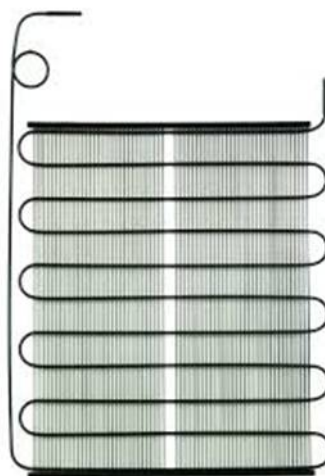


Fig 5: Cooling tank

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 3, March 2017

It consists of a number of parallel pipes which carries the working fluid kept inside the cooling system. The cooling system consists of a mixture of glucose and water, which cools down the heated vapour and it acts like a heat exchanger, thereby condensing the vapour into liquid state.

2.5. WORKING FLUID

The working fluid used here is ammonia water solution (The ratio of ammonia and water is 3:1). The purpose of using a binary mixture as working fluid in a power cycle is to decrease the irreversibilities due to disadvantageous of temperature matching in the heat exchange processes. Binary fluids boil and condense at increasing and decreasing temperatures respectively, while one-component fluids boil and condense at constant temperatures.

The mixture of ammonia and water is non-azeotropic. The characteristic for non-azeotropic mixtures is that the composition and temperature change during boiling for all possible compositions of the mixture. The boiling process for an ammonia water mixture is illustrated in Figure.

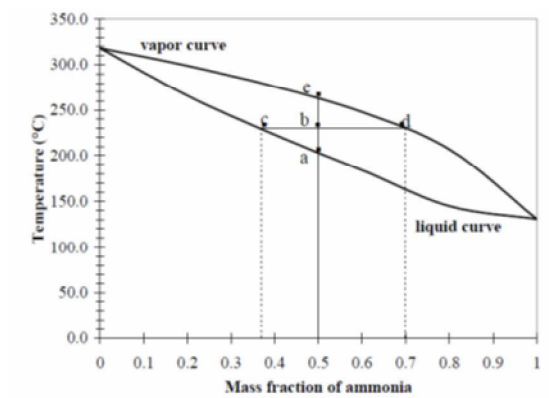


Fig 6: Phase diagram of Ammonia

PROPERTY	AMMONIA	WATER
Molar weight, (g/mol)	17.031	18.015
Boiling point (0.101 Mpa), (°c)	-33.4	100.0
Critical temperature, (°c)	132.3	374.1
Critical pressure, (Mpa)	11.35	22.12

Table 1: Property of Working fluids

2.6 SOLAR PANEL

Here a Plasmonic solar cell[4] is a type of thin film solar cell[5] that converts light into electricity with the assistance of plasmon. They are typically less than 2 μm thick and theoretically could be as thin as 100 nm. They can use substrates which are cheaper than silicon, such as glass, plastic or steel. One of the challenges for thin film solar cells is that they do not absorb as much light as thicker solar cells made with materials with the same absorption coefficient. Methods for light trapping are important for thin film solar cells. Plasmonic cells [6] improve absorption by scattering light using metal Nano-particles excited [7] at their surface plasmon resonance. Incoming light at the plasmon resonance frequency induces electron oscillations at the surface of the nanoparticles. The oscillation electrons can then be captured by a conductive layer producing an electrical current.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 3, March 2017

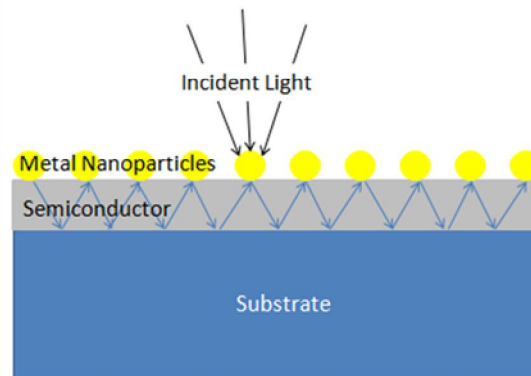


Fig 7: Plasmonic solar cell

III. CONCLUSION

By this device, more electricity charges, fuel wastage, pollution can be controlled. It will be useful renewable energy. The upcoming generation can produce their own electricity and it avoids the usage of nuclear power and thermal power plant. It is cost efficient and easily available devices which can be used to produce electricity.

IV. FUTURE SCOPE

Renewable energy can be produced with low cost. We can change the working fluid and its concentration for further study.

V. ACNOWELDEGEMENT

Thanks to our Secretary & Correspondent Dr. P. Chinnadurai and Principal Dr. K. Mani. We would like to sincerely thank our H.O.D. Dr. L. Karthikeyan, Department of Mechanical Engineering, Panimalar Engineering College. We appreciate his willingness to share his knowledge and insight that allowed us to perform our research.

REFERENCES

- [1] Zhiguang Li, Xiaoyan Ma, Que Kong, DuyangZang, Xinghua Guan, and XuehongRen, "Static and Dynamic Hydrophobic Properties of Honeycomb Structured Films via Breath Figure Method", *J. Phys. Chem. C*, 2016, 120 (33), pp 18659–18664, 2016 American Chemical Society.
- [2] Aldo Steinfeld and Robert Palumbo, "solar thermochemical process technology" *ENCYCLOPEDIA OF PHYSICAL SCIENCE & TECHNOLOGY* R. A. Meyers Ed., Academic Press, Vol. 15, pp. 237-256, 2001.
- [3] G. McKerricher, D. Titterington and A. Shamim, "A Fully Inkjet-Printed 3-D Honeycomb-Inspired Patch Antenna," in *IEEE Antennas and Wireless Propagation Letters*, vol. 15, no. , pp. 544-547, 2016.
- [4] S. S. Shivani, J. D. Alfreda, S. Deepa and G. S. Kumar, "A study on increasing the efficiency of the solar cell using nano metals," 2016 3rd International Conference on Electrical Energy Systems (ICEES), Chennai, 2016, pp. 228-231.
- [5] P. Müller-Buschbaum, J. S. Gutmann, M. Wolkenhauer, J. Kraus, M. Stamm, D. Smilgies, and W. Petry, "Solvent induce surface morphology of thin polymer films" *Macromolecules*, 2001, 34 (5), pp 1369–1375.
- [6] D. Dilip Kumar, R. Edwin Manoj and Dr. G. Siva Kumar, "Super-efficient solar panels with nano antennas" *IJSRD - International Journal for Scientific Research & Development* | Vol. 3, Issue 07, 2015.
- [7] S. K. Karthik, S. Akash, S. Jothichakaravarthy, Dr. G. Sivakumar and T. S. Senthil, "Increasing Efficiency of a Solar Cell by using PBSE Quantum Dots, ZnO Nanocrystal & TiO₂ Nano rod" *IJSRD - International Journal for Scientific Research & Development* | pg no : 1964-1967, Vol. 3, Issue 04, 2015.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 3, March 2017

BIOGRAPHY



UMA SHANKAR S

I am pursuing my B.E(Mechanical Engineering) in Panimalar Engineering College.I am a critical thinker and hardworker.I would like to build the best aerodynamic car which is useful for future generation automobiles.



ARUN G

I am pursuing my B.E(Mechanical Engineering) in Panimalar Engineering College . My interest is to do a lot of thermal related projects and to control the heat flow anywhere in the machine.



DHANUSH NARAYANAN R

I am pursuing my B.E(Mechanical Engineering) in Panimalar Engineering College.I have a innovative thinking on the working of Turbines and thoughts looking deep into it for the betterment in future.



Dr. Siva Kumar. G

I am working as professor of Panimalar Engineering College, Chennai, India. My area of research is nanomaterials, and polymer Nano composites. I would like to prepare new novel nanocomposites in nanomaterials.