

Nano-fluids and its Applications

P. Mahesh Reddy¹, T. Ganesh Kumar², C.V Raja Gopal Reddy³

¹Lecturer, Department of Physics, C.S.S.R & S.R.R.M. Degree & P.G. College, Kamalapuram, Telangana, India

²Lecturer, Department of Chemistry, C.S.S.R & S.R.R.M. Degree & P.G. College, Kamalapuram, Telangana, India

³Principal, C.S.S.R & S.R.R.M. Degree & P.G. College, Kamalapuram, Telangana, India

ABSTRACT

Nano fluid is a fluid in which nano sized particles like nano particles, nanofibers, nano tubes, nano rods, nano sheets ect. General fluids contain water, ethylene glycol and oil. Basically nano particles used in nanofluids are in general made of metals, oxides, carbides, or carbon nano tubes. Mainly two methods for preparing nanofluids, they are one step method and two step method. Nano fluids have different properties and useful in many applications like Liquid cooling, Crystal Silicon Mirror Cooling, Transformer Cooling, Biomedical Applications.

Keywords : Nano fluids, Nanofibers, Nanoparticles, Nanopowder, X-beam, Physical properties, Chemical properties.

I. INTRODUCTION

Nanotechnology includes research and innovation advancement at the nuclear, sub-atomic or macromolecular levels. Essentially nanotechnology is utilized to make structures, gadgets and frameworks that have novel properties and capacities due to their minute size. All things considered, the issue shows strange physical and compound properties because of increment in surface territory contrasted with volume as particles get littler in size and this is called quantum size impact. This implies the mass properties of materials at nanoscale can be altogether different from those at bigger scale.

Nano fluids are a new class of fluids designed by scattering nanometer-sized materials in base fluids. Nano fluids are nanoscale colloidal suspensions containing condensed nano materials. Nano fluids exhibit different physical and chemical compared to

those of base fluids like oil or water. Mainly two methods for preparing nanofluids, they are one step method and two step method. By using Nano fluids to study many fields, like physical and chemical properties.

II. METHODS AND MATERIAL

2. Types of Nano fluids:

The characteristics of nanofluids are represented by not just the sort and size of the nanoparticles yet in addition their scattering status in the pure water. Proper care was taken to make sure complete dispersion. Nanofluids are formed by dispersing nano size solid particles into conventional base fluids such as ethylene glycol, water, transformer oil, etc. In the production of nanofluids, agglomeration is a most important problem. There are two methods of nanofluids construction, namely two-step method and

single-step method. In the two-step method, the first step is the construction of nanoparticles and the second step method is the mixing of the nanoparticles in a conventional base fluid.

2.1 Single – step technique

The single step technique simultaneously utilized makes and scatters the nanoparticles straight into a traditional base liquid best for metallic nanofluids.

A few distinct procedures have been attempted to create divergent sorts of nanoparticles and nano suspensions. The primer materials went after for nanofluids were oxide particles, basically in light of the fact that they were anything but difficult to create and artificially stable in arrangement. Different examiners have delivered CuO, FeO and Al₂O₃ nanopowder by a latent gas build-up process and set up to be 20 - 200 nm measured particles.

The significant impediment of single step technique is that they are bad for large scale manufacturing which confines their commercialization. The fore most issue with this strategy is its liking to shape bunches and its contrariness to manufacture unadulterated metallic nano powders. The issue of grouping can be minimized to a decent degree by utilizing an immediate dissipation build-up technique.

2.2 Two – step technique

Two-advance strategy is broadly utilized technique for getting ready nanofluids. At that point the nano estimated measure powder will be spread into a base liquid in the subsequent agreement step with the assistance of definite attractive power inconvenience, ultrasonic purge, high shear blending,. The primary downside of the two-advance method is that the nanoparticles structure groups during the planning of the nanofluids which stays away from the right blending of nanoparticles inside the traditional base liquid. Because of high surface activity and surface region, nanoparticles tend to summate.

The famous technique to expand the dependability of nanoparticles in regular base liquids is the utilization of surfactants. Be that as it may, the operational of the surfactants under high temperature is too a major issue, especially for high temperature circumstances. Because of the trouble that happened in getting ready consistent nanofluids by two-advance strategy, in excess of a couple of cutting edge strategies are utilized to create nanofluids including single-step method.

Two-advance strategy is broadly utilized technique for getting ready nanofluids. Nanoparticles, nanotubes, nanofibers and other non materials utilized in this procedure are first framed as dry powders by physical and concoction techniques.

III. RESULTS AND DISCUSSION

3. Application of Nanofluids

Molecule size is the major physical boundary in nanofluids, since it very well may be used to adjust the nanofluids warm properties just as the suspension dependability of nanoparticles. Consequently, nanofluids can ready to stream openly through small scale or smaller scale channels with the scattering of nanoparticles. The nano suspensions show high warm conductivity which is basically because of improved convection between the nanoparticles and base fluid surfaces. Another potential advantage is that the nanoparticles have lower measurements so that the scattered nanoparticles are by all accounts like a base liquid atom in suspension.

3.1 Liquid cooling

Fluid Cooling is the significant specialized test confronting cutting edge enterprises, for example, microelectronics, metrology, assembling and transportation. It is profoundly alluring for the upkeep of different electronic items at wanted working temperatures for long life time and

appropriate working. The cooling execution was essentially improved with the guide of nanofluids (Lee and Choi 1996). In the domain of hardware cooling, the industrialists began utilizing nanofluids rather than traditional fluids. What's more, nanofluids could adequately evacuate problem areas and keep up parts at uniform temperatures. Thinking about the scope of endeavours to broaden fluid cooling innovations and the prevalent warm properties, nanofluids would be used for problem area cooling frameworks for PC, high warmth motion, telecom, and barrier and force hardware employments.

3.2 Crystal Silicon Mirror Cooling

Crystal Silicon Mirror Cooling A propelled cooling innovation was created utilizing nanofluids to cool gem silicon mirrors in high force x-beam sources was one among the underlying applications in the field of nanofluids research.

Nanofluids could fundamentally expand power densities and lessen warm protections. Moreover, the possibility of stream incited vibration and warm mutilation were tremendously disposed of by going nanofluids through micro channels inside the silicon reflect. The specialists likewise examined that power densities of around 3000 W/cm² for high viewpoint proportion micro channels were practiced with nanofluids.

3.3 Transformer Cooling:

The power generation industry is incredibly intrigued by transformer cooling application with the utilization of nanofluids for decreasing size and weight of the transformer. The consistently expanding interest for more noteworthy power creation, particularly in our country will require redesigns of most transformers sooner or later sooner rather than later at an expected expense of a large number of dollars in equipment retrofits. In particular,

nanofluids based transformer oil is probably going to be the next generation cooling liquid in transformers.

3.4 Biomedical Applications

Nanofluids were likewise produced for clinical medicines, including malignant growth treatment. Iron-based nanofluids could be utilized to create higher temperatures around the tumor cells, by slaughtering dangerous cells without influencing the close by sound tissues. Nanofluids could likewise be utilized for more secure medical procedure by cooling around the careful area, accordingly improving a patient's possibility of endurance and diminishing the danger of organ harm.

IV. CONCLUSION

Nanofluids are steady scatterings of nanoparticles in fluids and display absorbing properties that make them likely applicants in various applications. Properties of nanofluids, for example, the thermal conductivity, viscosity, specific heat, surface tension, critical heat flux, and optical properties were depicted and estimation techniques for these properties were likewise portrayed quickly.

Nanofluids are significant in light of the fact that they can be utilized in various applications including heat move, and different applications, for example, in biomedical, car and so forth. Colloids which are likewise nanofluids have been utilized in the biomedical field for quite a while, and their utilization will keep on developing. Colloids will see an expansion being used in biomedical designing and the biosciences.

V. REFERENCES

- [1]. Deepak Kumar Bairwa , Khagendra Kumar Upman, Ganesh Kantak "Nanofluids and its Applications" International Journal of Engineering, Management & Sciences (IJEMS)

ISSN-2348 –3733, Volume-2, Issue-1, January 2015.

Cite this article as :

- [2]. Xiang-Qi Wang; Arun S. Mujumdar, “A review on nanofluids - part II: experiments and applications”, Brazilian Journal of Chemical Engineering Braz. J. Chem. Eng. vol.25 no.4 São Paulo Oct./Dec. 2008, ISSN 0104-6632, ISSN 1678-4383.
- [3]. Davood Domairry Ganji, Sayyid Habibollah, “Application of Nonlinear Systems in Nanomechanics and Nanofluids”, Elsevier Publishers, ISBN: 978-0-323-3523-6.
- [4]. Wei Yu, Huaqing Xie, “A Review on Nanofluids: Preparation, Stability Mechanisms, and Applications”Hindawi, Volume 2012, Article ID 435873, 17 pages.
- [5]. K.R.V. Subramanian, Tubati Nageswara Rao, Avinash Balakrishnan, “Nanofluids and Their Engineering Applications”, CRC Press, ISBN: 978-1-1386-0526-8.
- [6]. Wen, D., Lin, G., Vafaei, S., Zhang, K., (2009), “Review of Nanofluids for Heat Transfer Applications”, Particuology, 7, 141-150.
- [7]. Manna, I., (2009), “Synthesis, Characterization and Application of Nanofluid – An Overview”, Journal of the Indian Institute of Science, 89(1), 21-33.
- [8]. Yu, W., Xie,H., (2012), “A Review on Nanofluids: Preparation, Stability Mechanisms, and Applications”, Journal of Nanomaterials, Volume 2012, doi:10.1155/2012/435873, 1-17.

P. Mahesh Reddy, T. Ganesh Kumar, C.V Raja Gopal Reddy, "Nano-fluids and its Applications", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 7 Issue 3, pp. 385-388, May-June 2020.

Journal URL : <http://ijsrset.com/IJSRSET207381>