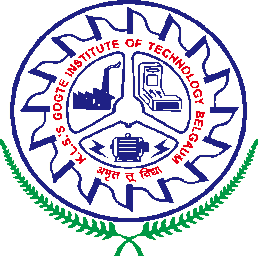
### KLS, Gogte Institute of Technology, Belagavi

### Department of Chemistry

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**A Seminar Report** on

“NON-NEWTONIAN FLUID”

**Submitted by**

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|  | Batch No. : | | | | | |
| 1. | Seminar Title: | Marks Range | ROLL NUMBERS | | | |
|  |  |  |  |
| 2. | Introduction (PO2) | 0-2 |  |  |  |  |
| 3. | Application of the topic to the course (PO2) | 0-3 |  |  |  |  |
| 4. | References / Literature survey(PO2) | 0-4 |  |  |  |  |
| 5. | Methodology, Results and Conclusion (PO1,PO3,PO4) | 0-6 |  |  |  |  |
| 6. | Report and Oral presentation skill (PO9,PO10) | 0-5 |  |  |  |  |
|  | Total | 20 |  |  |  |  |

Guidance by: Dr. Prasanna S. Koujalagi, Asst. Prof., Dept. of Chemistry, GIT.

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**ABSTRACT**

**The objective of this topic is to introduce and to illustrate the frequent and wide occurrence of Non-Newtonian fluid behavior in a diverse range of applications, both in nature and in technology. Starting with the definition of a Non-Newtonian fluid, different types of Non-Newtonian characteristics are briefly described. Representative examples of materials (foams, suspensions, polymer solutions and melts), which, under appropriate circumstances, display shear-thinning, shear-thickening, visco-plastic, time-dependent and visco-elastic behavior are presented. Each type of Non-Newtonian fluid behavior has been illustrated via experimental data on real materials. This is followed by a short discussion on how to engineer Non-Newtonian flow characteristics of a product for its satisfactory end use by manipulating its microstructure by controlling physico-chemical aspects of the system. Finally, we touch upon the ultimate question about the role of Non-Newtonian characteristics on the analysis and modeling of the processes of pragmatic engineering significance.**

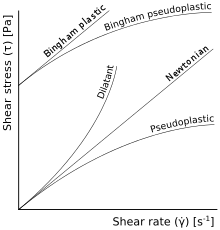
**INTRODUCTION**

**WHAT IS NON-NEWTONIAN FLUID?**

**A Newtonian fluid is defined as one with constant viscosity, with zero shear rate at zero shear stress, that is, the shear rate is directly proportional to the shear stress**.

**σyx = F/A = ηγyx**

**Viscosity remains constant, no matter how fast they are forced to flow through a pipe or channel. But the viscosity of some fluids is affected by factors other than temperature. These fluids are termed non-Newtonian fluids**.



**USAGE IN DAY TODAY LIFE**

**Many common substances exhibit non-Newtonian flows. These include:[6]**

* **Soap solutions, cosmetics, and toothpaste.**
* **Food such as butter, cheese, jam, mayonnaise, soup, taffy, and yogurt.**
* **Natural substances such as magma, lava, gums, honey, and extracts such as vanilla extract.**
* **Biological fluids such as blood, saliva, semen, mucus, and synovial fluid.**
* **Slurries such as cement slurry and paper pulp, emulsions such as mayonnaise, and some kinds of dispersions.**
* **And some more examples are:**

1. **OOBLECK**

**An inexpensive, non-toxic example of a non-Newtonian fluid is a suspension of starch (e.g., corn-starch) in water, sometimes called "oobleck", "ooze", or "magic mud".**

**Because of its properties, oobleck is often used in demonstrations that exhibit its unusual behaviour. A person may walk on a large tub of oobleck without sinking due to its shear thickening properties, as long as the individual moves quickly enough to provide enough force with each step to cause the thickening. Also, if oobleck is placed on a large subwoofer driven at a sufficiently high volume, it will thicken and form standing waves in response to low frequency sound waves from the speaker. If a person were to punch or hit oobleck, it would thicken and act like a solid. After the blow, the oobleck will go back to its thin liquid-like state.**

1. **FLUBBER [SLIME]**

**Flubber, also commonly known as slime, is a non-Newtonian fluid, easily made from polyvinyl alcohol–based glues (such as white "school" glue) and borax. It flows under low stresses but breaks under higher stresses and pressures. This combination of fluid-like and solid-like properties makes it a Maxwell fluid. Its behavior can also be described as being viscoplastic or gelatinous.**

1. **SILLY PUTTY**

**Silly Putty is a silicone polymer based suspension which will flow, bounce or break depending on strain rate**.

1. **PLANT RESIN**

**Plant resin is a viscoelastic solid polymer. When left in a container, it will flow slowly as a liquid to conform to the contours of its container. If struck with greater force, however, it will shatter as a solid.**

1. **QUICKSAND**

**Quicksand is a shear thinning non-Newtonian colloid that gains viscosity at rest. Quicksand's non-Newtonian properties can be observed when it experiences a slight shock (for example, when someone walks on it or agitates it with a stick), shifting between its Gel and Sol phase and seemingly liquefying, causing objects on the surface of the quicksand to sink**.

1. **KETCHUP**

**Ketchup is a shear thinning fluid. Shear thinning means that the fluid viscosity decreases with increasing shear stress. In other words, fluid motion is initially difficult at slow rates of deformation, but will flow more freely at high rates. Shaking an inverted bottle of ketchup can cause it to transition to a lower viscosity, resulting in a sudden gush of the shear thinned condiment.**