

Q&A Group 14.07.2020

In this section, all your questions have been categorized to be answered more efficiently.

Categories

- Compliance
- Flow Curve
- Oscillatory Rheometry
- Rheometer selection and reproducibility
- Master Curves
- Others

Compliance

- Can we obtain the elastic modulus from the recovery compliance? *It is possible*
- -Can you please explain what is the advantage of obtaining the complex viscosity?-Constanza Álvarez López *For those materials where the Cox-Mertz Rule applies is a nice way to get a wider range of shear rates*
- What information did you want to teach us? *The thing you need to learn is how that information is measured and how to use it for purpose of design and get materials features*
- In Constant stress rheometry (creep and compliance), I understood that the applied force can be adjusted to a constant value with a loop control. But, how machine measures the strain? (Is the lower plate free to move and the displacement measured in this way?)-Javid Azimi Boulali *For information on how the rheometer works, please go to the following link https://people.clarkson.edu/~skrishna/DHR_Rheology_Theory.pdf*
- Compliance and relaxation moduli seem reciprocal, but how do they relate to the viscous modulus, only through the stress? Is tau the same as sigma? I think I got the general idea from the paper but would like to understand the method in more depth, as I don't feel confident with the equations-Kendra Corral Nájera *Relaxation and compliance modulus are the inverse of each other in the Laplace transform domain*
- Can a fluid show shear thinning behavior in the steady shear flow studies while Newtonian behavior in the Creep recovery studies?-Seyedehniousha Mousavi *Let me explain it during the session*
- How do the creep and recovery compliance affects the extrusion or injection process?-"Bryan Iván Quintanar Abarca *The more elastic the higher the die swell*
- What does the Glassy compliance depend of? Is there a way of calculating it or are there some tables with the defined values of each material?-Bryan Iván Quintanar Abarca *(Nop, you have to measure it, but it should be very similar for a family of polymers since is the glassy part .*

Flow Curve

- Why we use the term "shear viscosity"? I mean why we add "shear". In the other words, why we don't call it just "viscosity". Is it because the viscosity is dependent on shear rate? I did not understand the point in slide 12? -Javid Azimi Boulali *The "proper" name should be viscous modulus. It is called the shear viscosity because is the result of measurements wher shera is present. The othje rwhere shaer is not present is called elongational viscosity (fibers, film)*

Oscillatory Rheometry

- Frequency is the velocity at which the parameter is changed or is a sudden change at certain time? I do not understand the interconversion, how creep data is overlapped? - *Benjamín Alberto Moreno Núñez* **Take a look at this video:**
<https://www.youtube.com/watch?v=urGKnj5Qmhc>
- What advantages we can get from develop the oscillatoy rheometry and get the complex response? - *Miguel Alejandro Pérez Salazar* **(You can get the relaxation spectra needed for modeling)**
- What i don't completely get is how to measure G^* yet. Like, the oscillatory rheometer gives it to you directly? like, this is the G' and G'' , or will it give E' and E'' or do we have to make the calculus? - *Marco Salazar Meza* **It is given to you by the instrument. THE IMPORTANT THING IS TO UNDERDSTAND THE MEANING FO THE DATA**
- If we want to have young moduls or elastic modulus, do we need to do oscillary rheometry? - *Zahra Taravatfard* **(This test is for liquids/melts/solutions)**

Oscillatory Rheometry

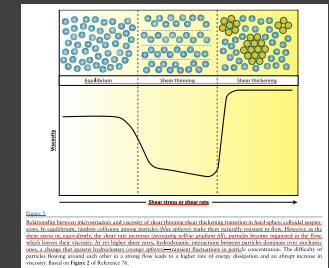
- The viscous modulus that we obtain in oscillatory rheometry is the same as one we can get in the slide 8? if not, what is the different between them and How should we know which one we should choos based on our material? *Zahra Taravatfard (By the COx-Mertz rule is the same as the sehar viscosity)*
- What is exactly complex viscosity (I know the formula but I want to understand the difference between the normal one and this? and whay do we need this? where do we use this?)-*Zahra Taravatfard It is a term wth the same units of viscosity and happens to be the same as shaer viscosity by the rule given above)*
- In oscillatory rheometry, is there a test where the strain increases gradually? Or is it constant strain?-*Angel Manuel Villalba Rodríguez It is a constant strain if you want to do a ramping i think you can handle the computer equipment)*
- Is it possible to measure the complex viscosity at zero shear rate?-*Antonio Osamu Katagiri Tanaka Actually, Zero shear rate will mean no movement at all, but we could say that is equivalent to say tha is at very low sear rate.*

Rheometer selection and reproducibility

- How do I know which type of rheometer to use for a specific case? I'm still confused about when to choose a specific type. -Angel Manuel Villalba Rodríguez *The rheometer is the same, the set up is different. If you mean capillary, brookfeld or parallel plate (trique rheometer) it depends on what you are looking for. Let us expand this concept in class.*
- Will a material at the same concentrations and conditions have the same results every time? *Yes, unless the material ages or decomposes with time.*
- To have characteristic curves of each polymer, for example. Angel Manuel Villalba Rodríguez *Yes, it is possible to have characteristic curves and is very helpful for comparing resins*
- Can you repeat me again the differences between oscillatory and capillary rheometry? Is it necessary to perform both tests in the same sample? Diego Sebastián Ceciliano Franco *Let us expand this concept in class.*
- I want to learn how to calculate all rheometer factors and properties of the polymers. I'm learning a lot from the theory, but I think that we need now the procedure and the steps to do it. During the exam, we saw that is not sufficient to study the theory, also we need to know about the practice and the mathematic procedures. -Jonathan Rafael Núñez *Yes, not everything will be learned during the session but the activities are designed, included the ones for the assessment, for you to acquire the knowledge, if you know the "equations" without the "theory", then you might be able to solve problems but not necessarily the concepts to keep creating new knowledge. Be patient this two weeks will give you the opportunity to fulfill the "craving" for equations and solutions using them.*

Master Curves

- The master curves for oscillatory rheometer are related to a fitting model or the purpose is to get a plot in terms of frequency? For the case of hydrogels what could be the difference in terms of frequency for storage modulus compare to loss modulus? -Katya Michelle Aguilar Pérez *For hydrogels the behavior can change at high shear rates For hydrogels the behavior is similar to some shear rate then (depending on the concentration) the material can become shear thickening at high shear rates.*
- *I will send a paper to the group about the soft materials' rheology*
- What is the use of a master curve? Does it can be measured from an experimental test? -Diego Sebastián Ceciliano Franco *Let us talk about it during class*
- I don't really understand the real meaning of the TTSTTS is used to determine properties at different temperatures ? What is the master curve for? -Jesús Alberto Martínez Espinosa *Let us talk about it during class*



Others

- I have understood that, besides the capillary test, there are some other ways to measure the real viscosity. Also, that there are some other moduli for liquids (depending on the class of rheometer used). (... Right?). **YES** Then, that all the moduli presented in the last class have a close relationship between them. **YES** It means that there is a dependence from each other but... Do we need the master curve for the interconversion of each one? **IT is better to have the largest amount of data possible to get better models** Can we do a interconversion without the master curve, for example, from a Constant stress modulus to a Relaxation modulus? **Yes, but s better to have the more data possible**-Juan Jesús Rocha Cuervo
- Could you please show us, step by step, a real example where the real viscoity was obtain using Oscillatory rheometer (apliying the Rabinowitch and Bagley Corrections and the Empirical equations)? -Juan Jesús Rocha Cuervo **I alredy did it in the presenattion and during the session but, let us have a meeting to explain that to you. Or perhaps I am not understandig your queston**
- If there is a Rheometry of constant stress, Is there a constant strain?-Bryan Iván Quintanar Abarca **(YES to both questions)**