Fluid Instabilities in a Double Layer Coater

Lichun Dong, Xusheng Wu and Dr. Duane Johnson
MINT Center and Department of Chemical Engineering
The University of Alabama

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Instabilities in the Double Coater

- Double layer coaters create a smoother coating for high density magnetic tape.
- Two fluid layers coated at high speeds have many instabilities that are not present in a single coater.
- Fluid interface deflections
  - Create non-uniformities in the tape
  - Can lead to mixing of the two layers
  - Disorients the dispersion

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Why Are We Interested?

• By adjusting the two fluid properties and operating parameters, we can avoid instabilities and fluid mixing.
Why Are We Interested?

• By understanding the instabilities we might hope to control and prevent them.
Current Experiments

- Qualitative experiments to determine which instabilities are present and which ones are important.
- Measuring the critical speed at which the interface deflects.
- Couette Cell (picture and top view)
Viscosity Of SiO2 Dispersion With Different Weight Percent Versus Shear Rate

![Graph showing viscosity of SiO2 dispersion with different weight percent versus shear rate.](graph)

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Interfacial Tension Of SiO2 Dispersion (PH =10.00) Versus Weight Percent
The Critical Experimental Reynold’s Number Compared With The Critical Theoretical Reynold’s Number

![Graph showing the comparison between theoretical and experimental Reynold’s numbers. The graph plots critical Reynolds number (Newtonian fluid model) against weight percent.]
Conclusions

• The interfacial tension of the SiO₂ dispersion decreases at lower weight percent, then increases with higher weight percent.

• The instability model of Newtonian fluids does not agree with the experiments (non-Newtonian dispersions).