

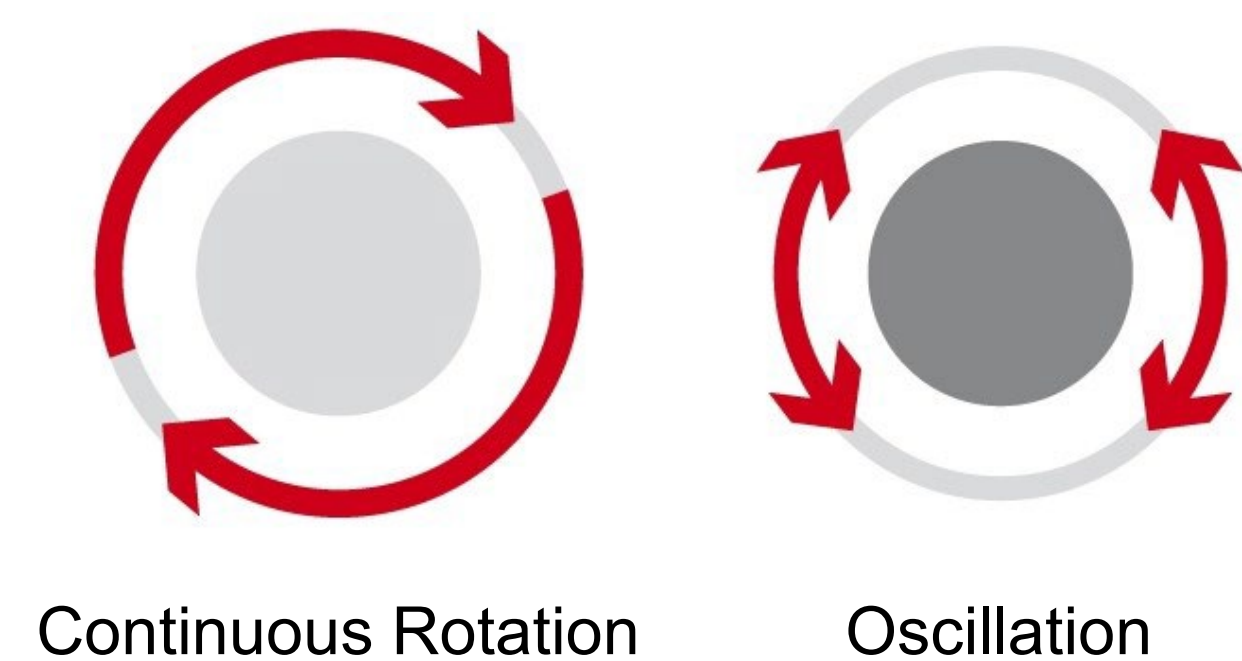
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Introduction

- SC-15 Part A is an epoxy used in many industrial applications.
 - It is an amorphous polymer that has no melting point.
 - But it does have a glass transition point.
 - The ultimate T_g of SC-15 Part A epoxy is 100°C.
- *T_g is the temperature at which a polymer undergoes the transformation from glass to a rubber.
- Viscosity tests are important because it gives manufacturers the ability to predict how the substance will behave in the real world.
 - For this experiment, five tests were performed using continuous rotation and rotational oscillation with a rheometer to demonstrate how different test types present different flow curves.

Rheometer

- Modern rheometers can operate with continuous rotation and oscillation to perform shear tests.



- The results are called flow curves.
- Rheometers measure the way a liquid flows under applied force.



The picture on the left belongs to the rheometer used for all the tests.

Discovery HR-2 is a hybrid rheology which gives better rheological data, under a wider range of measurement conditions.

Continuous Rotation Shear

Rotation shear tests can be carried out in two different modes.

-First way is the use of torque or shear stress.

- These types of tests simulate force-dependent applications such as squeezing toothpaste out of its tube.

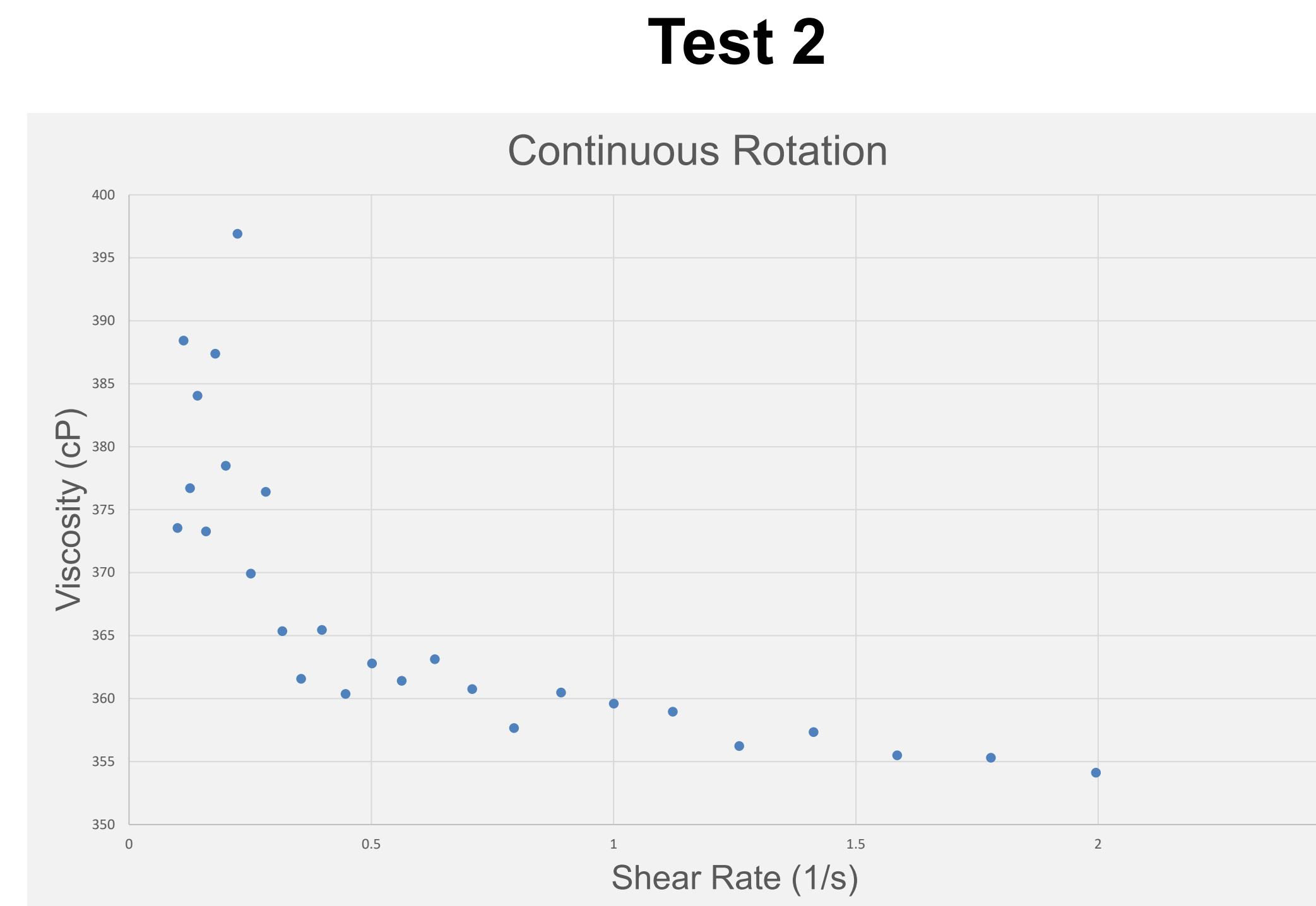
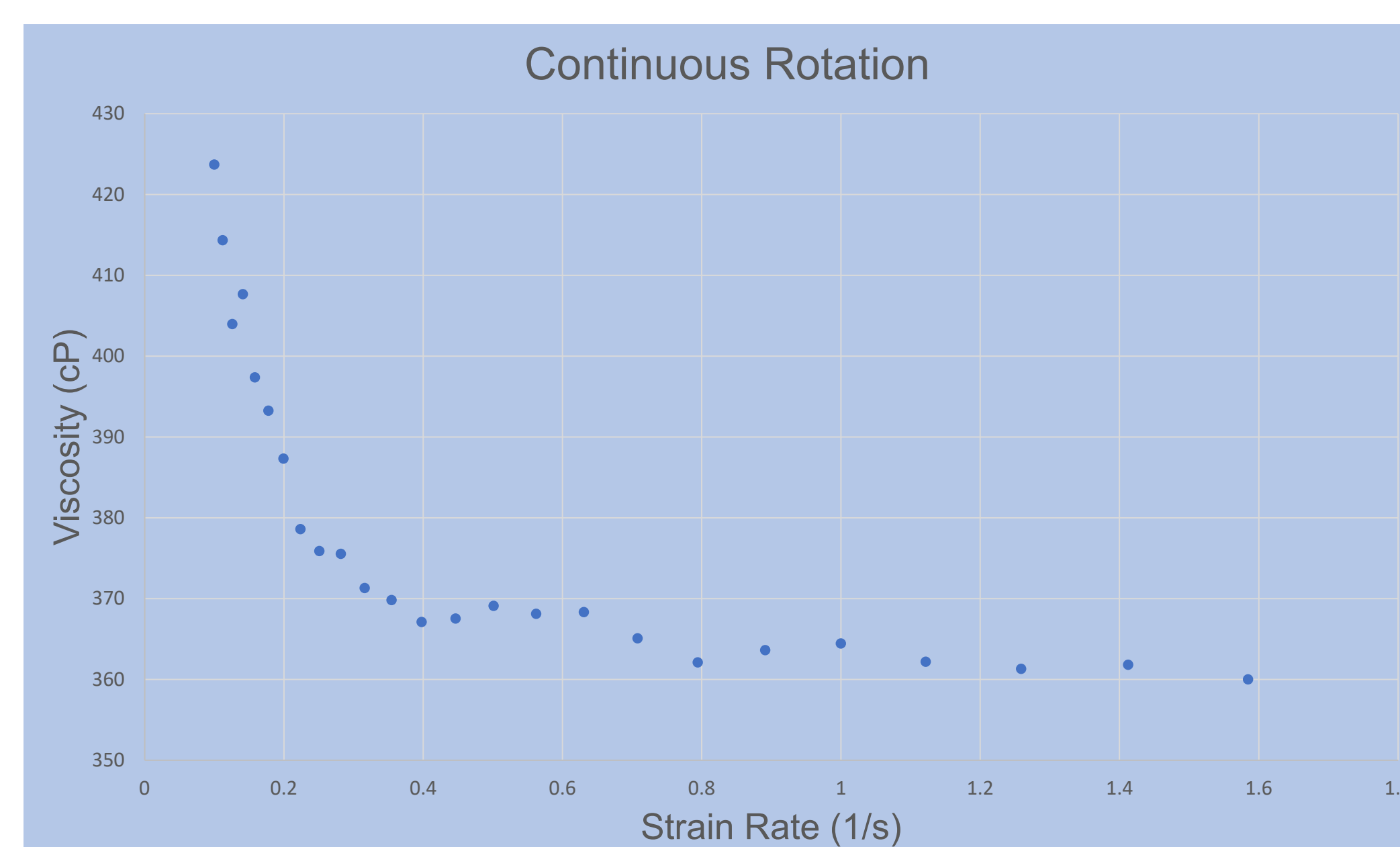
-Second way is the use of rotational speed or shear rate.

- Situations such as application of coatings with a brush can be given as an example of this method.

Area of Use

- Continuous Rotation is used to find viscosity of fluids.

Test 1

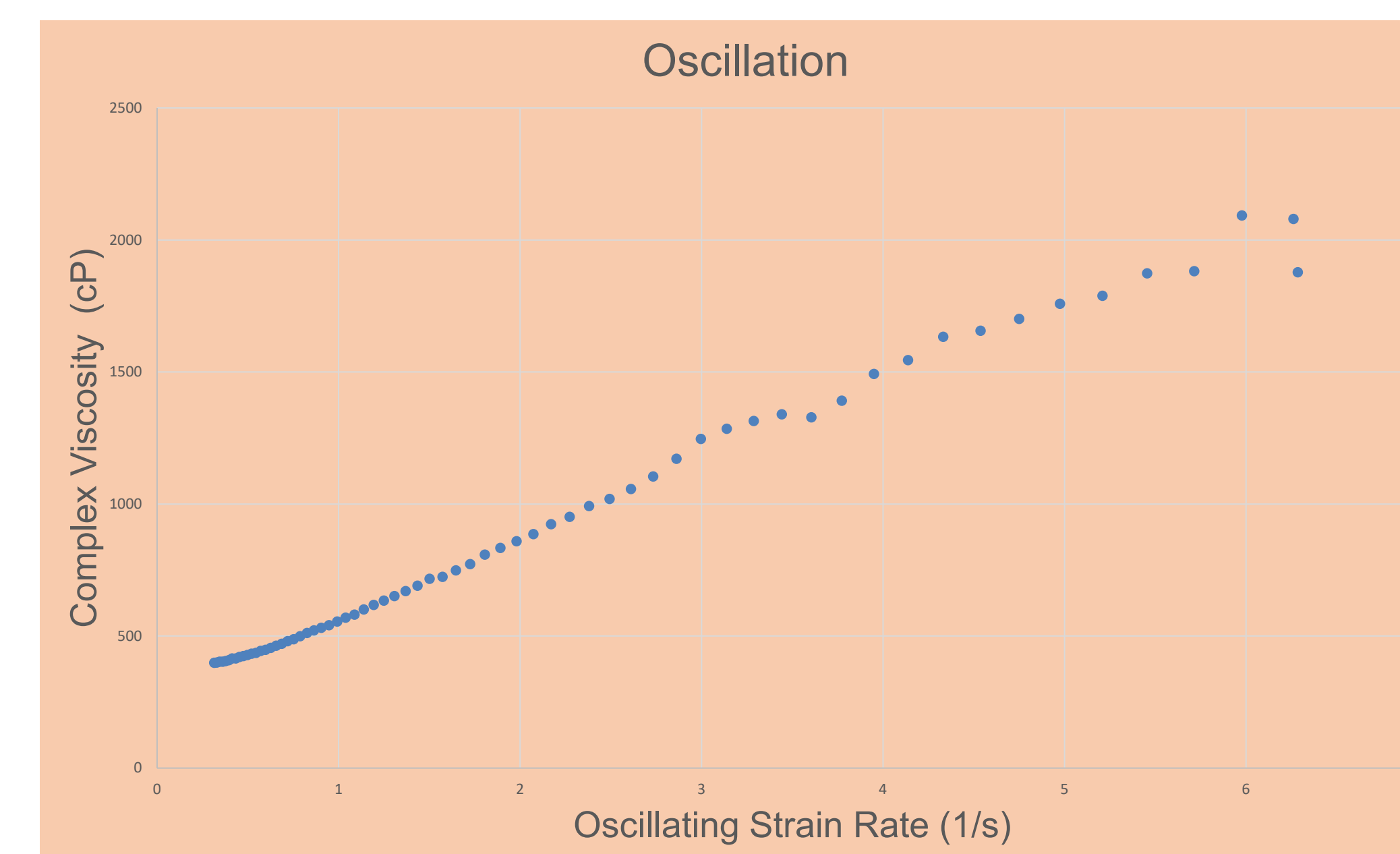


- Flow Sweep mode was used for both tests.

Oscillating Shear

Area of Use

- Oscillation is used to find complex viscosity of fluids.



Test Parameters

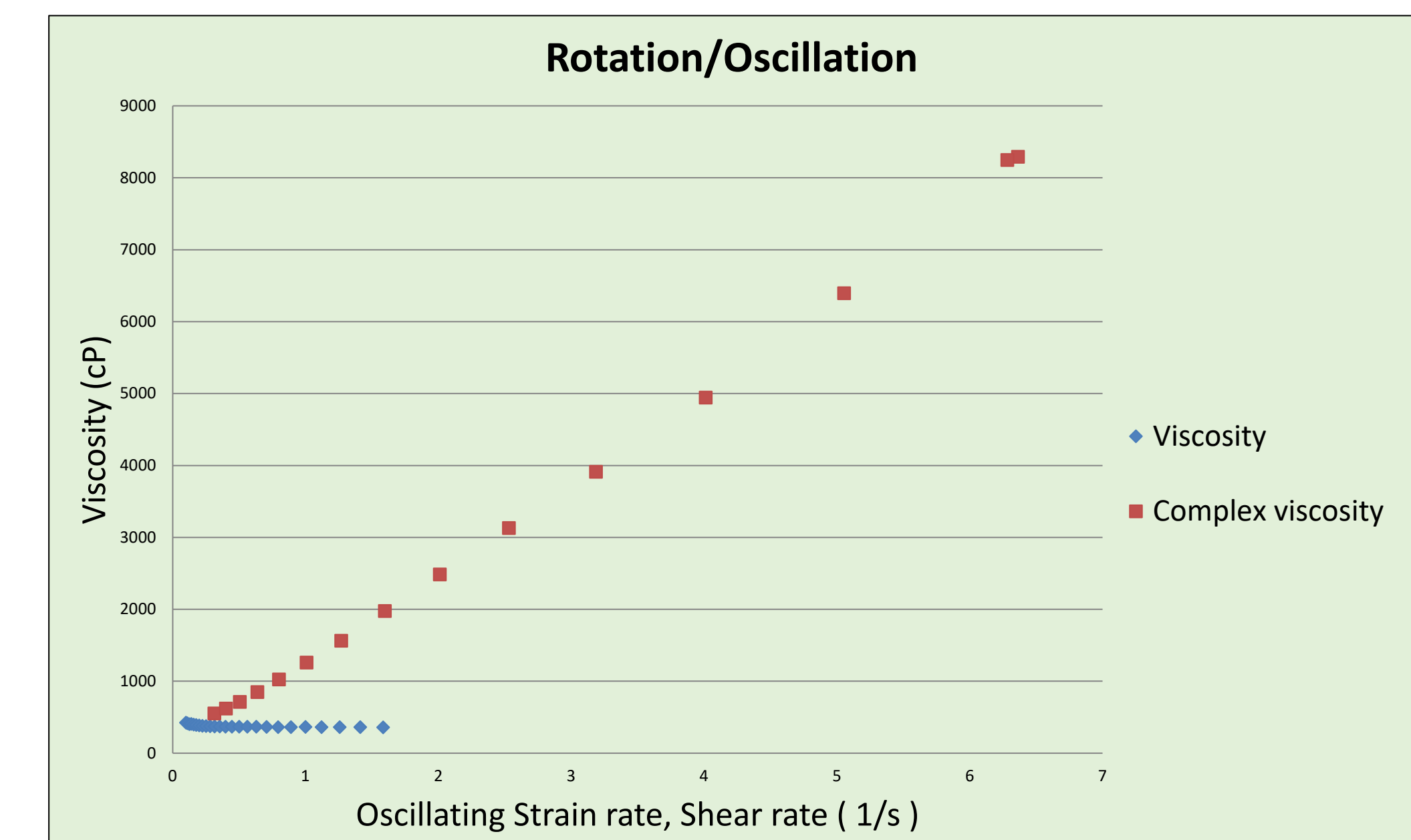
- Frequency Sweep (5Hz – 100Hz)

Complex Viscosity

- It is given by the quotient of the maximum stress amplitude and maximum strain rate amplitude.

- In 1967, J.D. Huppler, a professor from Chemical Engineering Department of University of Wisconsin, caused the lower plate of the Weissenberg Rheogoniometer to oscillate sinusoidally through several degrees rotation. The amplitudes of oscillation of the driven and nondriven platens were measured, together with the phase shift between the oscillations of the two platens.
- Later, this data was used to measure the complex viscosity.

Results and Discussion



- Above chart explicitly shows the difference between rotational mode and oscillatory mode rheology test results of SC-15 Part A epoxy.

Acknowledgements

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