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LUBRICATING EYE DROP COMPARISON

USING THE

NANOVEA T50 TRIBOMETER

Prepared by

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Introduction

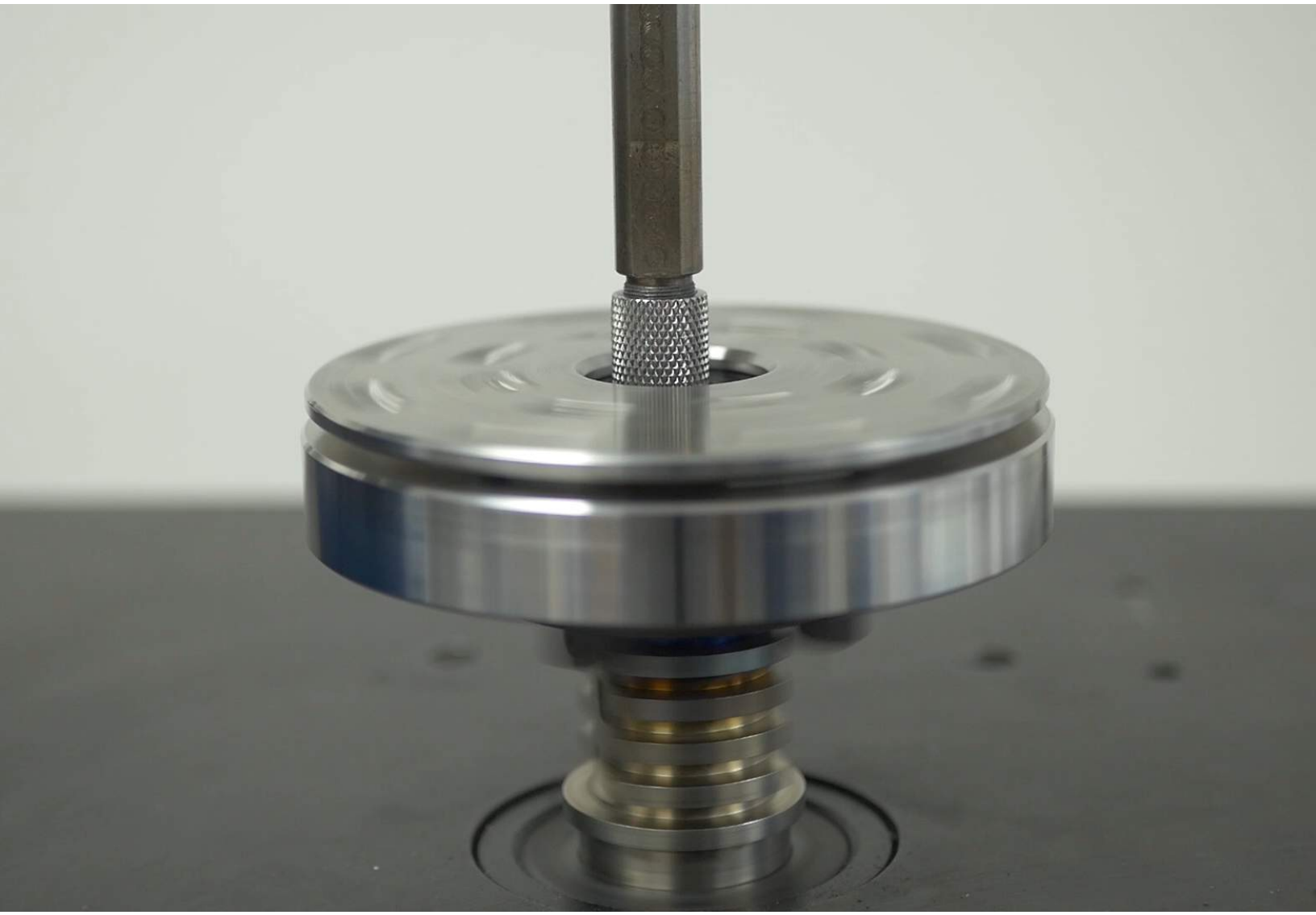
Eye drop solutions are used to alleviate symptoms caused by a range of eye problems. For example, they can be used to treat minor eye irritation (e.g. dryness and redness), delay the onset of glaucoma or treat infections. Eye drop solutions sold over-the-counter are mainly used to treat dryness. Their effectiveness in lubricating the eye can be compared and measured with a coefficient of friction test.

Importance of Testing Eye Drop Solutions

Dry eyes can be caused by a wide range of factors, for example, computer eye strain or being outdoors in extreme weather conditions. Good lubricating eye drops help maintain and supplement the moisture on the outer surface of the eyes. This works to alleviate the discomfort, burning or irritation and redness associated with dry eyes. By measuring the coefficient of friction (COF) of an eye drop solution, its lubricating efficiency and how it compares to other solutions can be determined.

Measurement Objectives

In this study, the coefficient of friction (COF) of three different lubricating eye drop solutions was measured using the pin-on-disk setup on the Nanovea T50 Tribometer.



Eye-drop solution sample on Nanovea T50 Tribometer

Measurement Parameters

A 6mm diameter spherical pin made of alumina was applied to a glass slide with each eye drop solution acting as the lubricant between the two surfaces. The test parameters used for all experiments are summarized in Table 1 below.

Please note that the alumina pins and glass slides used in this study were chosen due to their availability at the time of testing. A wide range of materials and lubricants can be used to simulate real life applications or tailor the experiment below.

Test Parameters	
Load	**1 N**
Duration of test	**3 min**
Rotational rate	**200 rpm**
Radius of track	**2 mm**
Revolutions	**600**
Ball Diameter	**6 mm**
Ball Material	**Alumina**
Lubricant	**Samples A, B, C, D**
Temperature	**23°C (room)**

Table 1: Test parameters for COF measurements.

Samples of eye-drop solutions

Results and Discussion

The maximum, minimum, and average coefficient of friction values for the three different eye drop solutions tested are tabulated in Table 2 below. The COF v. Revolutions graphs for each eye drop solution are depicted in Figures 2-4. The COF during each test remained relatively constant for most of the total test duration. Sample A had the lowest average COF indicating it had the best lubrication properties.

Sample	Max COF	Min COF	Avg COF
A	0.578 ± 0.205	0.18 ± 0.277	0.317 ± 0.121
B	1.05 ± 0.02	0.121 ± 0.071	0.78 ± 0.024
C	1.09 ± 0.06	0.085 ± 0.069	0.84 ± 0.103

Table 2: The measure coefficient of friction values for Samples A, B, and C.

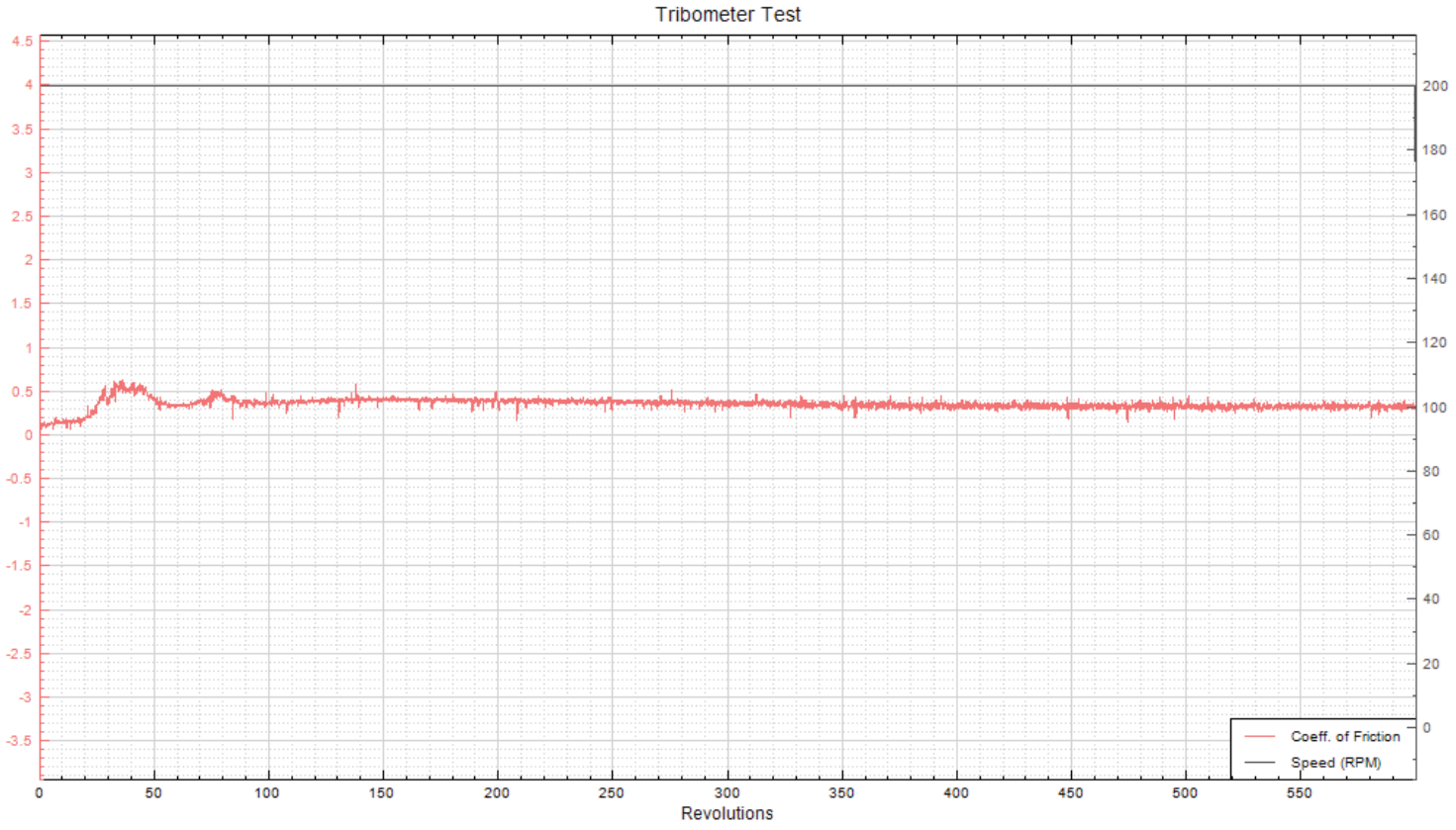


Figure 2: Change in COF over number of revolutions for Sample A.

Results and Discussion

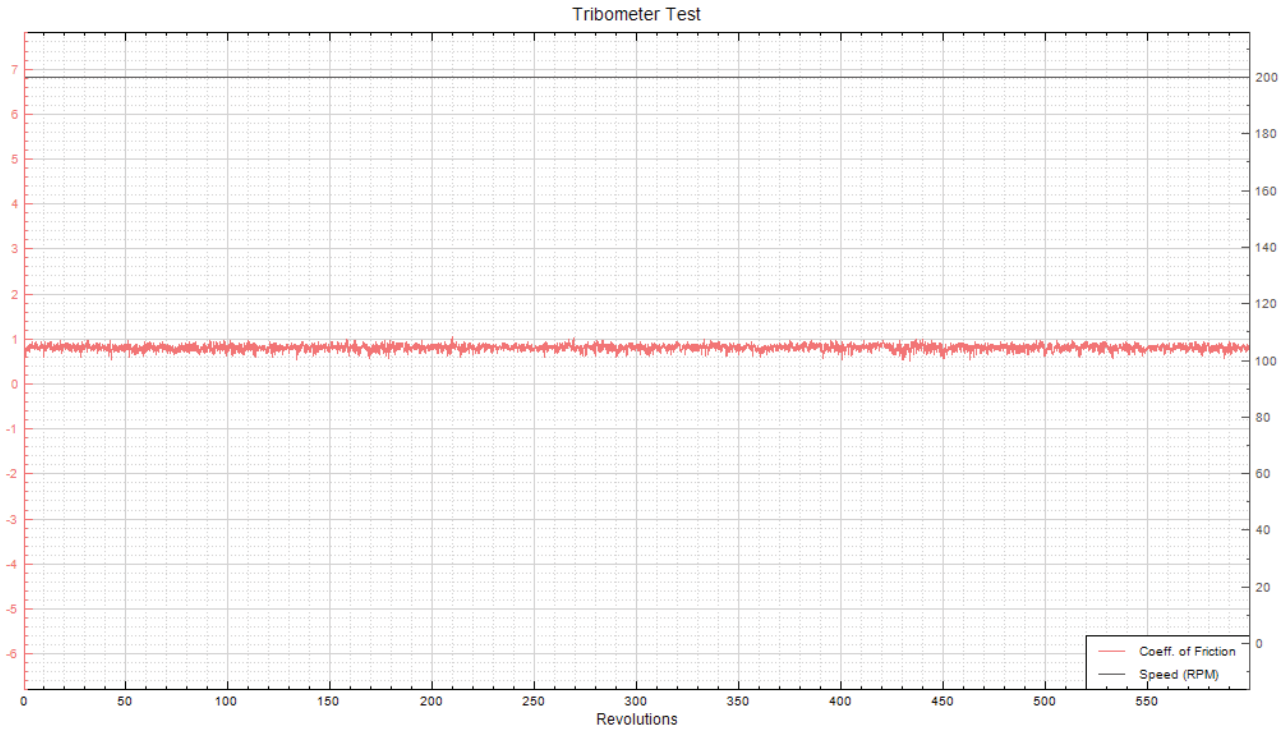


Figure 3: Change in COF over number of revolutions for Sample B.

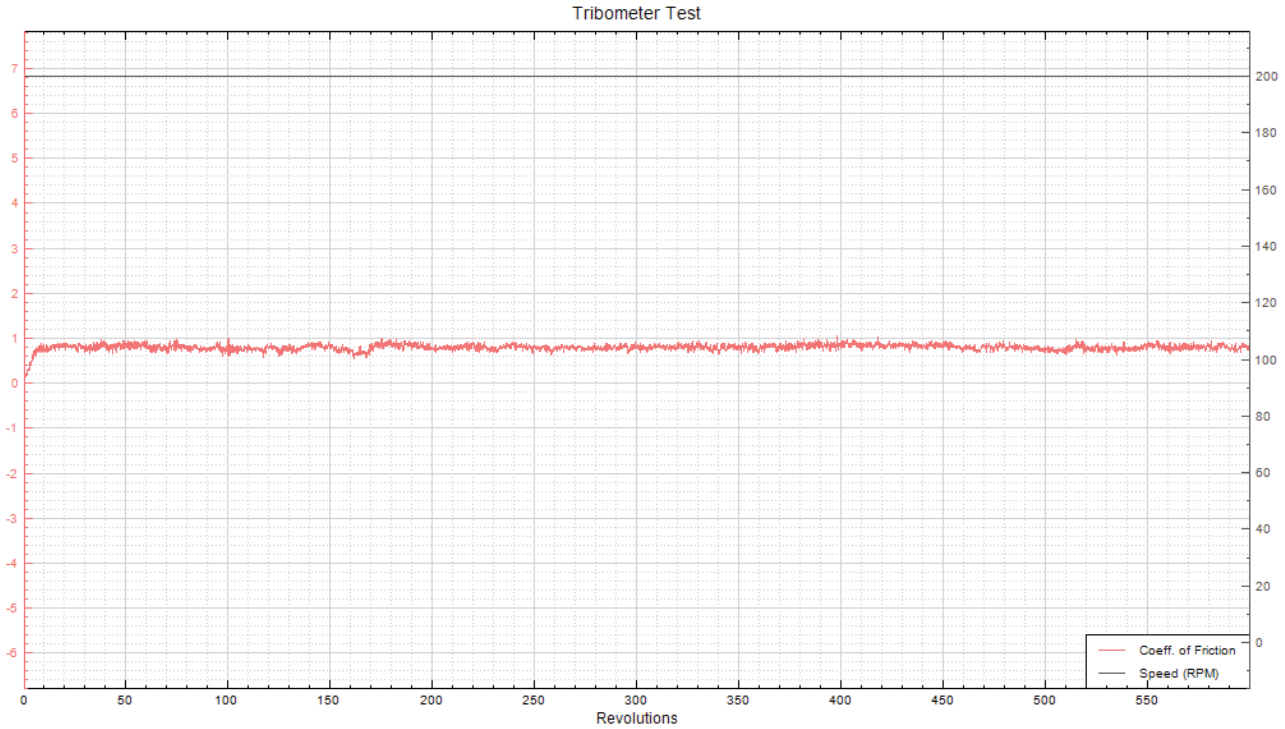


Figure 4: Change in COF over number of revolutions for Sample C.

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Conclusion

In this study we showcase the capability of the Nanovea T50 Tribometer in measuring the coefficient of friction of three eye drop solutions. Based on these values, we show that Sample A had a lower coefficient of friction and therefore exhibits better lubrication in comparison to the other two samples.

Nanovea Tribometers offers precise and repeatable wear and friction testing using ISO and ASTM compliant rotative and linear modules. It also provides optional high temperature wear, lubrication, and tribo-corrosion modules available in one pre-integrated system. Such versatility allows users to better simulate the real application environment and improve fundamental understanding of the wear mechanism and tribological characteristics of various materials.

Learn more about Nanovea Tribometer or Lab Services.

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T2000
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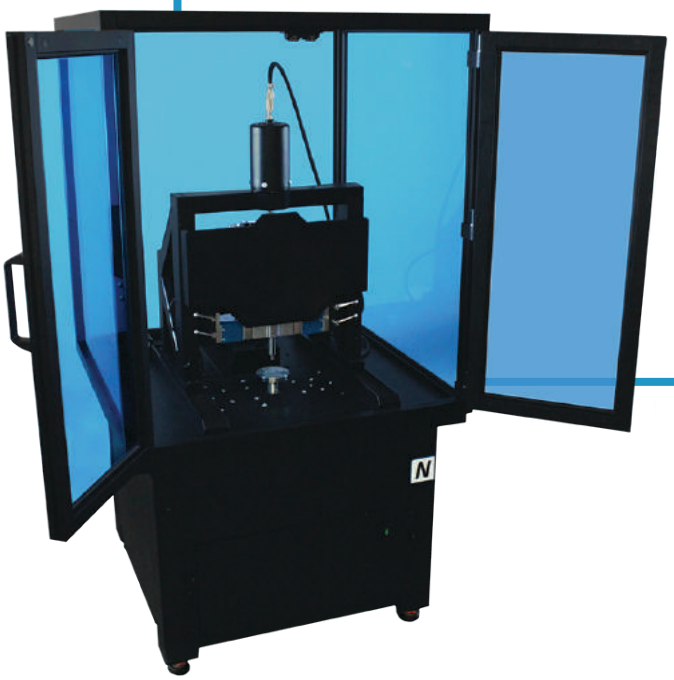

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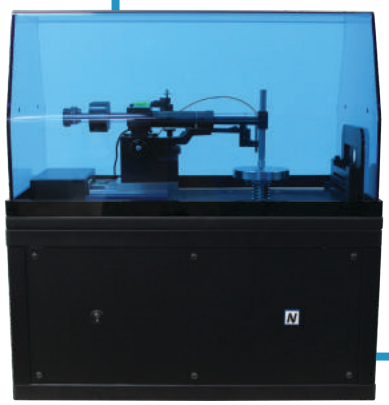

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