

PHYSICAL AGING of CARBOPOL

DIPTESH BISWAS

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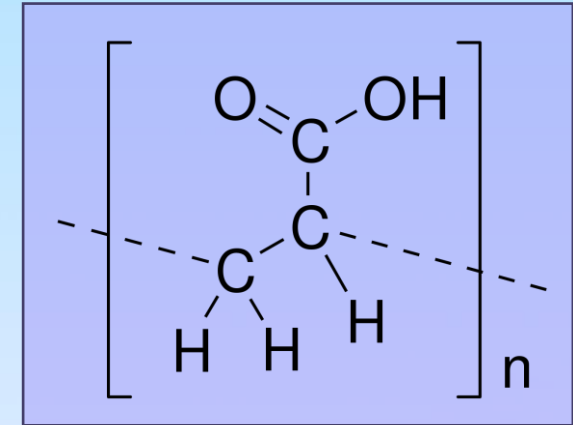
OBJECTIVE

- To understand **physical aging** of **Carbopol**

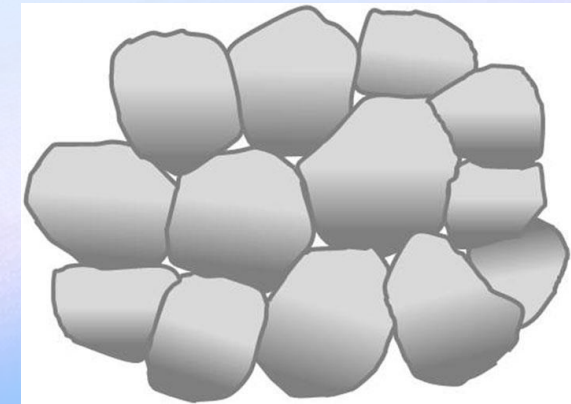
INTRODUCTION

What is Carbopol?

- ❖ Carbopol is a **gel**
- ❖ Gel is formed due to swollen of water and **crosslinks** between **polyacrylic acid** and dispersed **particles**
- ❖ Diameter **0.2-6μm**, pH **3-5**



Polyacrylic acid¹



Schematic microstructure representation of Carbopol²

METHODOLOGY

Material

- ❖ 0.2wt% of Carbopol gel made in 2020

Rejuvenation

- ❖ Constant shear rate of 200s^{-1} for 80secs

Aging Test

- ❖ Small amplitude oscillatory test
- ❖ $\dot{\gamma}_o = 0.01$, $f = 0.1\text{Hz}$ for 10mins and 3mins

Creep Test

- ❖ Oscillatory stress sweep test for 60secs
- ❖ Stress amplitude of 5Pa at 1Hz

RESULTS

Storage Modulus

- Weakly aging
- No distinguishing features in the storage modulus

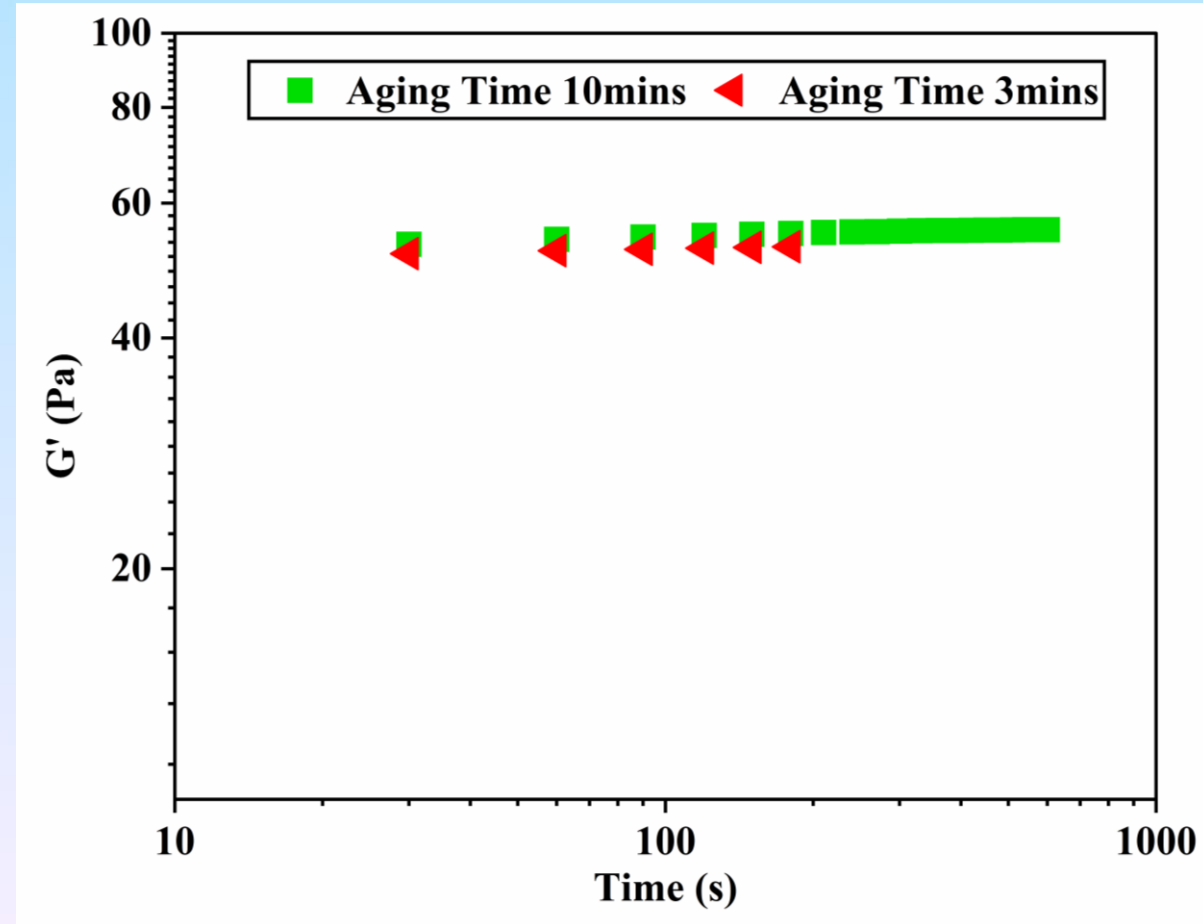


Figure: Storage modulus vs time

RESULTS

Creep Test

- Comparatively **strong increase** in **Creep** behavior

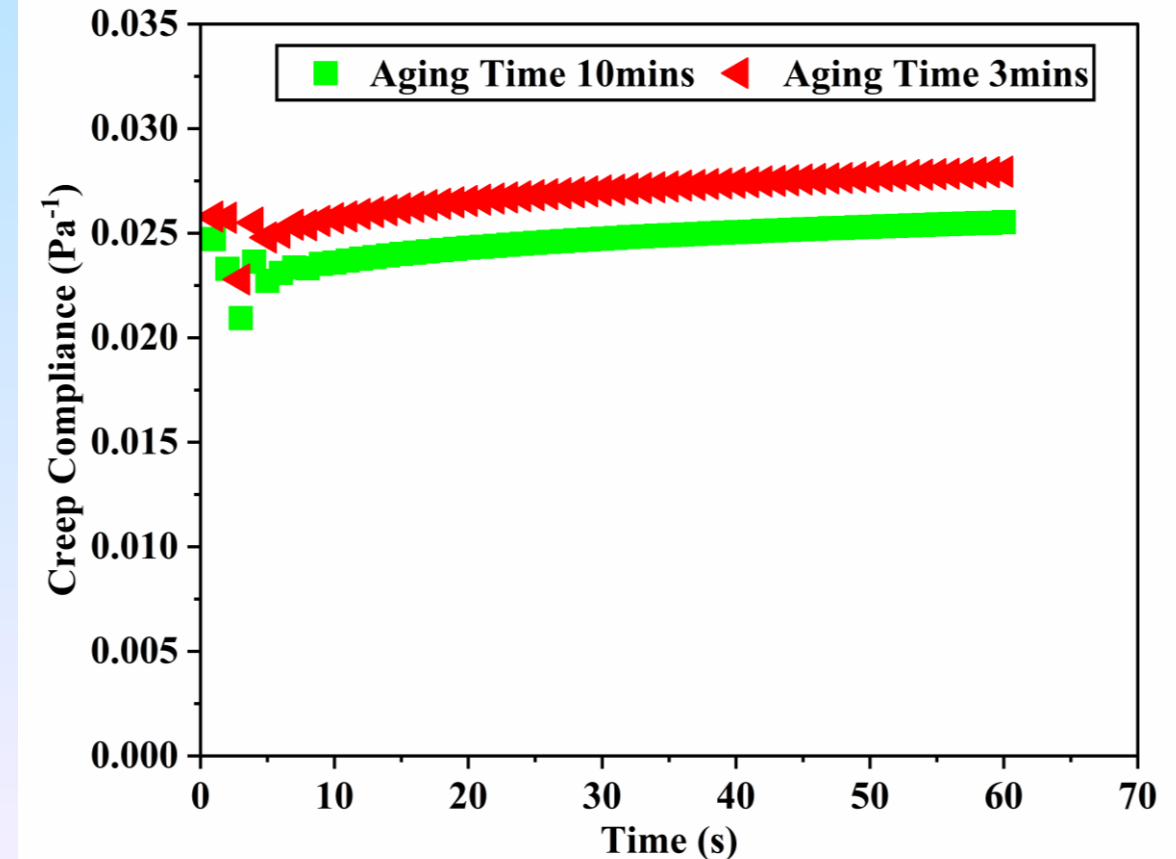


Figure: Creep compliance vs time

CONCLUSION

- **Storage modulus** shows a **weak change** as a **function of time**
- **Creep test** shows a **strong change** in behavior to give the assurance of **physical aging**



REFERENCES

1. M. Agarwal and Y. M. Joshi, “Signatures of physical aging and thixotropy in aqueous dispersion of Carbopol,” *Phys. Fluids*, vol. 31, no. 6, 2019, doi: 10.1063/1.5097779.

The background features a soft, abstract illustration of a smiling face in shades of blue, purple, and pink. The face is positioned on the left side of the frame. To the right of the face, there are decorative elements: a white starburst icon near the top right, a series of thin white concentric circles extending from the starburst, and a small white wavy line near the bottom right. The overall aesthetic is gentle and celebratory.

THANK YOU