Anadolu Reoloji Derneği
Anatolian Society of Rheology

Webinar Series # 1 : **Prof. Dr. Dimitris Vlassopoulos**

Başlık/Title: Using macromolecular loops to tailoring the rheology of soft materials

Biography: Diploma, Chemical Engineering, NTU Athens, 1983; PhD, Princeton Univerity, 1990. Employment history Metelco SA, Athens (1984), Mobil R&D, Paulsboro, N.J. (1990-1992), FORTH (1992-), University of Crete (2002-). The underlying research theme is the molecular rheology and engineering of soft materials. Strategies are devised based on the design of model systems with adaptable molar mass, macromolecular architecture or tunable interactions and bridging polymers and colloids. Current topics include nonlinear rheometry, ring polymers, supramolecular polymers, macromolecular networks, jammed topological states, microrheology at extreme pressures, vitrimers. FORTH prize for basic research (2009), Weissenberg Award – European Society of Rheology (2015), Bingham Medal – The Society of Rheology SOR (2019), Fellow, SOR (2018), Fellow APS (2019). European Editor Rheologica Acta (2006-2011), Associate Editor Soft Matter (2015-2021), Editor-in-Chief, Journal of Rheology (2022-).

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Konu/Subject: The presence of free ends is largely responsible for the remarkable flow properties of entangled polymers because of the associated large conformational entropy of the macromolecular chains and ability to easily randomize their direction. This is reflected on the transient entanglement network that is characterized by a rubbery plateau modulus, and the mechanism of disentanglement to leads to macroscopic motion. Unlike their linear counterparts, entangled cyclic (or ring) polymers, that have no free ends, do not exhibit a plateau modulus. This important effect has significant consequences in biology (e.g., genome folding). In this presentation, we briefly review the field and discuss recent work on the addition of loopy structures (rings or single chain nanoparticles) to linear polymer matrices, that yields a delayed response due to threading. Rings exhibit weak shear thinning and an unusual, strong extension rate thickening, that is absent in entangled linear polymers. They also form stronger depletion gels compared to their linear counterparts. These features provide ways to tailor the properties of polymers entropically through blending of different molecular structures.

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