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Macromolecular Origins of Harmonics Higher than the Third in Large-Amplitude Oscillatory Shear Flow[1] ALAN GIACOMIN, LAYAL JBARA, PETER GILBERT, Queen's University, CHEMICAL ENGINEERING DEPARTMENT TEAM — In 1935, Andrew Gemant conceived of the complex viscosity, a rheological material function measured by "jiggling" an elastic liquid in oscillatory shear [*Rheol. Acta*, **51**, 481 (2012)]. This test reveals information about both the viscous and elastic properties of the liquid, and about how these properties depend on frequency. The test gained popularity with chemists when John Ferry perfected instruments for measuring both the real and imaginary parts of the complex viscosity [*Mem. Trib., NAE*, **17**, 96 (2013)]. In 1958, Cox and Merz discovered that the steady shear viscosity curve was easily deduced from the magnitude of the complex viscosity, and today oscillatory shear is the single most popular rheological property measurement. With oscillatory shear, we can control two things: the frequency (Deborah number) and the shear rate amplitude (Weissenberg number). When the Weissenberg number is large, the elastic liquids respond with a shear stress over a series of odd-multiples of the test frequency. In this lecture we will explore recent attempts to deepen our understand of the physics of these higher harmonics, including especially harmonics higher than the third.

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