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Mechanics of Active Microtubule Gels: Can confinement determine elasticity? CLAUDIA DESSI, DANIEL BLAIR, Georgetown University, DANIEL CHEN, ZVONIMIR DOGIC, Brandeis University — A rheological characterization of the viscoelastic properties of active microtubule based biopolymer gels is presented. Passive in-vitro biopolymer networks have been intensively characterized using bulk- and micro-rheology. However, active networks remain largely unexplored. Using stabilized microtubules, kinesin motor proteins, and adenosine triphosphate (ATP), we explored the dynamic viscoelastic transition from active to passive states of a unique class of biologically derived extensile active materials. By means of our coupled confocal-microscopy rheometer platform (con-rheo) we directly determine the bulk network response while simultaneously quantifying the microscopic dynamics based on the activity magnitude as driven-force. Our preliminary results indicate that these materials may be simply viscous in the active state despite the existence of long-lived spanning filaments. However, we observe a clear transition to elastic behavior that occurs as the magnitude of the activity is gradually reduced in time. We will discuss how the magnitude and the nature of active-to-passive dynamics transition depends on the geometry confinement. This is related to the observed different structural arrangement due to different fluid dynamics regime.

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