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QCM Studies of Polymer Gel Spreading in Liquid Environments FRANK NUNALEE, BRUCE LEE, PHILLIP MESSERSMITH, KENNETH SHULL, Northwestern University — Adhesion of polymer gels to substrates is a complicated phenomenon, particularly if the system is submerged in a liquid. Establishment of mechanical contact hinges upon the details of the gel's surface structure. In many cases, the polymeric component of the gel is shielded by a segregated solvent layer. These issues have important implications for those interested in soft, adhesive materials for biological applications. In this investigation, we utilize the surface sensitivity of the quartz crystal microbalance (QCM) to study the spreading behavior of polymeric liquids and gels on a rigid surface while submerged in a liquid medium. While the QCM has been used extensively to study adsorption by exploiting its sensitivity to material properties in the direction normal to the crystal's electrodes, few studies have utilized the QCM's ability to sense changes in loading in the plane of the electrodes. We propose equations to describe the predicted response of the QCM to a generalized viscoelastic material spreading at the QCM surface at the expense of the surrounding liquid medium. Several experimental examples are given in order to support the validity of the proposed equations, including situations where the spreading material is a Newtonian liquid, a polymer solution, or a polymer gel.

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