

FLUORESCENT MOLECULAR ROTORS AS MECHANOSENSORS IN BIOFLUIDS

Walter J. Akers

Dr. Mark A. Haidekker, Dissertation Supervisor

ABSTRACT

Many disease states have associated blood viscosity changes. Molecular rotors, fluorescent molecules with viscosity sensitive quantum yields, have recently been investigated as a new method for biofluid viscosity measurement. Biofluid viscosity measurements by conventional methods are complicated by protein adherence to surfaces and formation of air-surface layers. The presented work demonstrates the usefulness of fluorescence viscometry using molecular rotors dissolved in aqueous solutions and blood plasma. The precision of fluorescence viscometry is compared with that of a state-of-the-art cone and plate viscometer. The interaction of molecular rotors in solution with blood plasma proteins is reported. The viscosity sensitivity of surface-immobilized molecular rotors to glass nanoparticles and optical fibers is also investigated. Conclusions: fluorescence viscometry using molecular rotors promises to be a powerful new method for biofluid viscosity measurement, delivering fast readout for microliter volume samples.