APPLICATION OF DYNAMIC LIGHT SCATTERING TO PROBE MOLECULAR DYNAMICS IN POLYMER GELS

A PROJECT REPORT PRESENTED BY

SURAN KOKILA GALAPPATHTHIGE

To the board of study in physics of the

POSTGRADUATE INSTITUTE OF SCIENCE

In partial fulfillment of the requirement

For the award of the degree of

MASTER OF SCIENCE IN PHYSICS OF MATERIALS

Of the

UNIVERSITY OF PERADENIYA

SRI LANKA

2010

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Suran Kokila Galappaththige
Department of Physics
University of Peradeniya
Peradeniya
Sri Lanka
2010

In Dynamic Light Scattering experiments we measure the time dependence of the light scattered from a very small region of solution, over a time range from microseconds to milliseconds. These fluctuations in the intensity of the scattered light are related to the rate of diffusion of molecules in and out of the region being studied (Brownian motion), and the data can be analyzed to directly give the diffusion coefficients of the particles doing the scattering.

Polymer gel systems are interesting candidates for Dynamic Light Scattering (DLS) studies form a number of different viewpoints. The physical properties of the gel, its elasticity, permeability, dangling ends, diffusion of connected and unconnected strands and foreign particles produce readily measurable effects on the density fluctuations which are probed by light scattering.

In this work we are investigating polymer gel systems to identify the different modes of relaxation and the diffusion coefficient of these systems. Several relaxation modes are observed in these systems which are obtained by the non invasive dynamic light scattering method. A fast diffusive relaxation, an intermediate relaxation and in some occasions a slow mode of relaxation was obtained. All these three modes are not always obtained while the calculated diffusion coefficients from the intensity autocorrelation help us to get an idea of the movement of the compounds in the gel medium. The results of a polymer gel electrolyte studied show a lower diffusion coefficient at higher concentrations of polymer matrix.