MAPPING THE HOMOGENEITY OF HYDROGELS BY DYNAMIC LIGHT SCATTERING

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Abstract- These Dynamic light scattering studies has been done on gelling solutions and on hydrogels prepared from three different types of calcium alginate (different mannuronic-to-guluronic ratios). The values of the characteristic length and full width at half maximum of the distribution of the characteristic length (FWHM) have been obtained for different position of the laser beam scattered from the hydrogels set in cylindrical glass cells. The correlation length for the hydrogels has been found very large in order of millimeters beyond the size of the measuring cell (or the size of the gels)which indicates that the gels can be considered as homogenous. The only difference with the gelling solutions is that for the gels, the characteristic length decreases with increase of the temperature. That has been found as a characteristic behavior for physical hydrogels to which group calcium alginate gels belong. The chemical gels, i.e. gels built by chemical bonding, have opposite behavior – the values of the characteristic length usually increase with increase of temperature.The inhomogeneity of the hydrogels has been controlled by inducing microgel particles of calcium alginate in the sodium alginate gelling solution. By addition of calcium ions in the gels during setting, the characteristic length decreases. This dependence should be viewed in connection with the existence of microgel particles of calcium alginate in the gelling solutions. Further setting the gelling solution with added calcium ions lead to gellation in the following 24 hours and brings only microgel structures to be redistributed randomly everywhere through the gel which leads to increase of the inhomogeneity of the gel which always ends with contraction of the gel's correlation length.

Keywords- Dynamic Light Scattering, Hydrogels, Correlation Length.