Gregory D Reinhart, Enrico Gratton, and William W Mantulin.

Dissociation of large oligomeric proteins by high hydrostatic pressure: dynamic light scattering studies.

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Abstract

In the study of oligomeric protein association, the combined approach of high hydrostatic pressure perturbation with optical spectroscopic detection has provided great insight into structure and dynamics of these complex systems. Various spectroscopic methods offer advantages in specific cases. For example, a decrease in the light scattering intensity tracks the pressure induced dissociation of oligomeric proteins. However, optical artifacts complicate the interpretation of light scattering experiments under pressure. Dynamic light scattering offers the possibility of directly detecting changes in the translational diffusion coefficient, which change with oligomer dissociation, rather than the total scattered intensity associated with oligomer dissociation. Dynamic light scattering offers greater sensitivity for the study of very large oligomers, that are not readily accessible using other spectroscopic methods. In addition, dynamic light scattering is conveniently used in conjunction with high hydrostatic pressure perturbation. We have performed dynamic light scattering experiments on the pressure dissociation of hemocyanin (gastropod), a very large molecular assembly (approximately 8x106). Under ambient pressure conditions, dynamic light scattering measurements show a heterogeneous oligomer population. The application of about 2 kbar of pressure strongly changes the dynamic light scattering spectrum by depleting most of the low frequency spectral components (large molecular weight oligomers). Supported by NIH RRO3155.