

## CHARACTERIZATION OF EXTENDED TIME SCALE 2D IR PROBES OF PROTEINS

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The role of dynamics in the function of proteins is well appreciated, but not precisely understood due to the difficulty in their measurement. Two-dimensional infrared (2D IR) spectroscopy is a powerful approach for the study of protein dynamics with high spatial and temporal resolution. This approach has led to the development of spectrally resolved IR probes that can be applied towards the measurement of dynamics at specific sites in a protein. However, the experimental time scale is limited by the vibrational lifetime of the probe, as such there remains a need for extended time scale probes. Towards the development of better 2D IR probes for the study of protein dynamics the spectroscopic characterization of *p*-cyano-seleno-phenylalanine (CNSePhe), isotopically labeled *p*-(<sup>13</sup>C<sup>15</sup>N-cyano)phenylalanine (<sup>13</sup>C<sup>15</sup>NPhe) and the site-specific incorporation of <sup>13</sup>C<sup>15</sup>NPhe in the protein plastocyanin is discussed. The incorporation of the heavy Se atom and the isotopic labeling are shown to increase the vibrational lifetime of the probe which results in collection of 2D IR spectra for analysis of dynamics on longer timescales.