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Exploring the Structure of an Amyloid-forming Peptide

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Beamline(s): X8C

Amyloid is an ordered, extremely stable, fibrillar protein aggregate involved in the pathogenesis of multiple diseases. Though amyloid formation is accompanied by an increase in β -structure, the quaternary interactions that give rise to amyloid are not well understood. The peptide NNQQ from the prion-determining domain of the yeast prion Sup35 forms bundles of needle-shaped microcrystals that diffract to approximately 1.0 Å. Several lines of evidence suggest that the NNQQ peptide in the crystal adopts structural features found in naturally occurring amyloid.

The rotational disorder of the microcrystals in the bundle results in a rotationally averaged diffraction pattern. Information is lost when reflections with similar Bragg plane spacings produce overlapping rings. The density of the rings increases with resolution; the resolution limit is the point where the spacing between rings is less than the width of a ring on the detector. The superior optics of the NSLS beamline X8C have allowed us to collect patterns with sharper rings, increasing the effective resolution to ~ 4 Å. We have also experimented with anisotropic samples; reflections are recorded as arcs on the detector rather than full rings. This anisotropy may allow us to separate reflections beyond 4 Å.