



## グローバル COE 物質科学イノベーション講演会

演 題 : **Spectroscopic detection and diagnostics of amyloidic proteins using luminescent conjugated polymers and related compounds**

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共 催 : 工学研究科生物機能高分子専攻セミナー

要旨 : Oligomeric precursors or intermediates of misfolded proteins or peptide fragments can mature into fibrillar amyloid aggregates giving rise to diseases as the Alzheimers and the like. As the reactions occur at low concentration distributed over large volumes of the infected organs the molecular mechanisms behind protein toxicity are hard to study. To use luminescent probes is an attractive way of detecting hidden species as the probes report back well-defined light upon interrogating with light of another wavelength. Moreover, modern photonics technology allows the detection of very weak light levels, *i.e.* low concentrations of luminescent probes, and map these in 3D using Laser Scanning Microscopes. Thioflavin T or S (ThT or ThS) and Congo red are commonly used as detection agents for amyloid deposits in biopsies or in ex vivo post mortem samples and these dyes. Small molecule dyes such as 4-(dicyanovinyl)-julolidine (DCVJ) as well as derivatives of amino-8-naphtalene sulphonate (ANS, Bis-ANS) have been used for amyloid fibril detection by binding to the fibrillar or pre-fibrillar states with dissociation constants of typically from the  $\mu\text{M}$  range. Luminescent conjugated polymers (LCPs) in contrast to sterically rigid amyloidotropic dyes such as thioflavins and Congo red, contain a conjugated polymeric backbone (*e.g.* poly-thiophene) whose flexible geometry alters the spectroscopic properties upon non-covalent binding to proteins. We present and discuss the possibility to distinguish various amyloid protein fibril conformations as well as two different kinds of filamentous “noodle”- and “needle”-like insulin amyloids, using a series of polythiophene acetic acid derivatives. Special attention is paid to the multiphoton absorption capability of LCPs and their utilization in laser scanning microscope spectral imaging diagnostics.

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