Thursday, April 13, 2017

12:15 pm, Room 1315 Chemistry

Analytical Seminar

Department of Chemistry

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"Solid-state NMR studies of graphene-based systems and misfolded Amyloid-β Assem-

This work involves two separate topics on solid-state NMR (SSNMR) applications to graphene-related nano-materials and protein nano-assemblies associated with Alzheimer's disease (AD). First, we present SSNMR structural studies on graphene- and graphite-based nano materials. It is demonstrated that SSNMR is a powerful tool to analyze the structures and chemical reactions for graphene/graphite oxide,[1,2] which are widely used as precursors of mass-production for graphene -based materials.

Second, we discuss structural studies of amyloid misfolding for 42-residue Alzheimer's amyloid b (Aβ). Misfolded fibrillar assemblies of Ab called amyloid fibrils are a primary component of senile plaque, a hallmark of AD. Increasing evidence suggests that formation and propagation of misfolded assemblies of 42-residue Ab (Ab42), rather than the more abundant 40-residue Ab40, provokes the Alzheimer's cascade. Our group recently presented the first detailed atomic model of Aβ42 amyloid fibril based on SSNMR data.[3] The result revealed a unique structure that was not previously identified for Ab40 fibril. Based on the results, we discuss our ongoing efforts to analyze a structural conversion in misfolding of Ab42 from oligomeric intermediates to fibrils. The metastable oligomers is associated with brain-derived Ab oligomer called amylo-spheroid (ASPD).[4,5] Additionally, cross seeding of Ab42 with other Ab isoforms will be discussed. The results provide insight into amyloid misfolding of Ab42 in Alzheimer's disease. Other topics such as ultra-high-field SSNMR for biological applications will be discussed.[6,7]