NEXT/NanoX Invited Scientists

Guest name	Hiroko YAMADA
Position	Full Professor
Affiliation	Nara Institute of Science and Technology (NAIST)
Host laboratory in NEXT/NanoX	CEMES GNS
NEXT/NanoX contact (name and e-mail)	Claire Kammerer (kammerer@cemes.fr) André Gourdon (gourdon@cemes.fr)
Dates of stay	From 4th to 30th of november 2019

Brief Biodata

Hiroko Yamada received her Ph.D. degree in 1992 from Kyoto University, under the guidance of Prof. Kazuhiro Maruyama and Prof. Atsuhiro Osuka, focusing on the synthesis and characterization of carotenoid-linked porphyrins. She was selected as a Research Fellow of the Japan Society for the Promotion of Science (JSPS) in 1992-1994. In 1993, she worked with Prof. Michael R. Wasielewski in Argonne National Laboratory, USA. In 1994, she joined International Research Laboratory, Ciba–Geigy Ltd., then moved to Ciba Specialty Chemicals Inc. She started her academic career in 1998 as a post-doctoral researcher in Osaka University. In 2003, she became associate professor in Ehime University, and moved to an associate professor position in Nara Institute of Science and Technology in 2011 where she was promoted full professor in 2012.

Research project during the visit at NEXT

Descriptive Title π-extended aromatic compounds as key subunits for mechanical nanomachines and organic materials.

Generation of π-extended aromatic compounds have been extensively studied as organic electronics materials and functional dyes. Low molecular organic electronics materials are expected as next-generation materials because of the following advantages: (1) freely designable molecular structures, (2) high purity, (3) excellent crystallinity, and (4) easy control of the electronic structure by introducing substituents. Thanks to these advantages, they are expected to realize extremely high charge carrier mobility in the crystalline state. However, materials with high purity and crystallinity are often poorly soluble in common organic solvents, and HOMO energy levels of the π-extended aromatic compounds are shallow to be easily oxidized. Synthesis and purification of such poorly soluble and unstable compounds are difficult with traditional organic synthetic methods. To overcome these problems, Yamada developed the "precursor approach", a way to synthesize scarcely-soluble and unstable π-extended aromatic compounds from the soluble and stable precursors by photodecarbonylation reaction of α-diketone moiety or retro–Diels-Alder reaction of bicyclo[2.2.2]octadiene framework. The reactions proceed quantitatively and pure compounds are obtained without purification. Then, a wide range of new aromatic compounds of great interest for GNS are now possible to be prepared.

This approach could be an interesting strategy to follow to obtain interesting targets in collaboration with Claire Kammerer and Gwenael Rapenne in the field of molecular machines as well as with André Gourdon in the field of extended polyaromatics synthesized on surface.