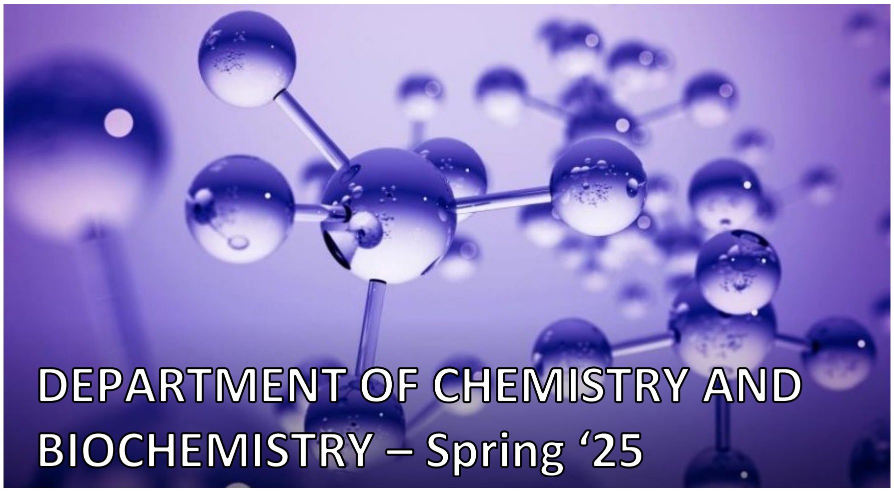


# THE SALZBERG CHEMISTRY SEMINAR SERIES

The City College of New York

CREST IDEALS PHASE II

**Monday, March 10 2025 @ 12:00 noon – MR1027**

# Preparation of $AgGaTe_2$ layers toward solar cell applications

**Masakazu Kobayashi**
Department of Electrical Engineering and BioScience
Waseda University, Tokyo

**Abstract:** $AgGaTe_2$, a chalcopyrite I-III-$VI_2$ compound, has a band gap energy close to that of sunlight and exhibits a high optical absorption coefficient. It is also attracting attention as an environmentally friendly material because it does not contain Se nor Cd and less In. $AgGaTe_2$ thin films have been formed by the close-space sublimation method and fabricated into solar cell devices with a structure of Glass/Mo/p- $AgGaTe_2$ /n-$ZnIn_2S_4$ /ZnO: Al. In the past, the close-space sublimation method was performed using $Ga_2Te_3$ powder source, and the obtained $AgGaTe_2$ layer was about 20% Te-rich from the stoichiometry. $AgGaTe_2$ thin films with near stoichiometry could be formed when the source was replaced with GaTe powder. Tuning the $AgGaTe_2$ thin film from stoichiometric to Ga-rich composition would lead to higher conversion efficiencies. Therefore, two methods of achieving Ga-rich $AgGaTe_2$ thin films were examined. After thin films were formed, X-ray diffraction θ-2θ measurements were performed. When diffusion/deposition time was increased from 10 to 45 minutes, the FWHM of the $AgGaTe_2$ peak around 24.9°was increased, and the Ga-rich $AgGa_5Te_8$ peak appeared, with 30% of the $AgGaTe_2$ diffraction intensity. Extension of diffusion/deposition times as well as the use of Ga:Te = 80:20 source materials were effective to fabricate Ga-rich $AgGaTe_2$ thin films, and the use of these film were effective to increase the efficiency of $AgGaTe_2$ solar cell.

**Biography**: Masakazu Kobayashi received the B.Eng. degree from Waseda University in 1983, and the Dr. Eng. degree from Tokyo Institute of Technology in 1988. He then joined the MBE group at Purdue University as a Postdoctoral Fellow. He moved to Chiba University in 1992 and in 2000, he joined Waseda University as a full professor.Dr. Kobayashi has been working on molecular beam epitaxy (MBE) since he was a senior student of the undergraduate program. He worked on the MBE growth of InGaAlSb, ZnSe:Mn DC Electroluminescence devices, ZnSe-ZnTe strained layer superlattices, and the blue-green laser diode made from ZnSe/ZnCdSe multiple quantum wells (MQW). He also worked on visible blind UV sensors by ZnCdMgS compounds and related superlattices. Recently his interests include novel terahertz detection device structures using ZnTe epilayers on sapphire substrates, and the photovoltaic devices using Te-based Chalcopyrite materials. In addition to the film growth, his research activity covers a wide range of characterization methods including TEM analysis, photoluminescence (PL) characterization, various XRD techniques including pole figure analysis, and others.

**Join Meeting in-person at MR-1027**