

Session of Focus Materialchemie – Wednesday, 14.12.2022 16:00 – @ Seminarraum Lehar 02 (TU-Wien, Getreidemarkt 9, BC, OG. 02, room A46) – [join us](#) on ZOOM (ID: 983 0066 2349)

Fundamental insights and photocatalytic applications of emerging 2D materials—MXenes

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A new family of two-dimensional transition metal carbides and nitrides (MXenes) have shown promising properties suitable for various applications. In this seminar, I present an overview of the fundamental properties of MXenes, recent advances in their photocatalytic applications, and our approaches to designing optimal photocatalysts using MXenes. Designing composite photocatalyst systems with nano-scale precision play the main role in establishing sound electronic energy structures to promote the separation of photo-generated charge carriers. We demonstrate a new method of facet-selective electrostatic assembling of metallic 2D $\text{Mo}_{1.33}\text{C}$ MXene and octahedral single-crystal metal oxides where $\text{Mo}_{1.33}\text{C}$ is preferentially attached to specific facets of the oxides particulates by rationally adjusting the acidity of the solution. In such configurations, photo-generated electrons and holes get separated toward different facets of the oxides. At the same time, the Schottky barriers are created at the interface of the semiconducting oxides and metallic MXenes, trapping electrons and further enhancing the charge separation. Our work brings a new conceptual idea to the facile, versatile design of composite photocatalyst systems optimal for efficient photocatalysis.

Biography: Shun Kashiwaya received his MSc degree in Electrical engineering in 2014 from the Tokyo University of Science and his dual Ph.D. in chemical physics from the University of Bordeaux and materials science from the Technical University of Darmstadt in 2018. After completing a postdoc at Linköping University, in 2022, he joined the Department of Physics, Chemistry and Biology at Linköping University. His research interests are exploring new elemental and compound 2D and their energy-relevant electrochemical applications, such as photocatalysis, with a focus on their electronic properties.