

## 高効率な Sn/Pb 混合ペロブスカイト太陽電池の開発

### Development of Efficient Mixed Sn and Pb-based Perovskite Photovoltaics

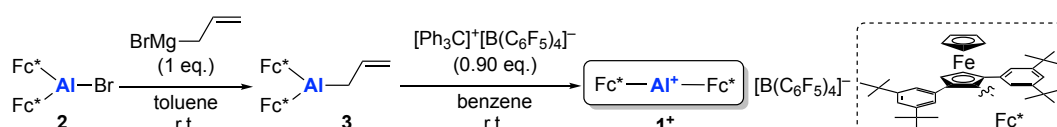
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#### Summary of research results

The goal of our collaborative research with Prof. Dr. Atsushi Wakamiya (ICR, Kyoto University) is development of efficient Pb/Sn-based perovskite-based solar cells, and pioneering research achievements on the basis of the fusion of elemental science and functional physical chemistry. Challenges for efficient perovskite-based solar cells such as Sn(II)/Pb(II)-based ones include the facile oxidation of divalent E(II) which leads to the increased nonradiative charge recombination in the perovskite films. Thus, we focused our research targets on the creation of low-coordinated main group element species as effective oxidation scavengers, which exhibit redox-activity and considerable solubility in organic solvents.

Tricoordinated compounds of Group-13 elements, such as aluminum(III) compounds, display Lewis acidity and/or electrophilicity due to their low-lying vacant p-orbitals, and are widely employed as catalysts in organic synthetic chemistry. In this regard, such Lewis acid or electrophile should exhibit potential as an effective oxidation scavenger. To develop more potent Lewis acids and/or electrophiles, significant research efforts have focused on the synthesis of trivalent/dicoordinated cationic species of Group-13 elements paired with weakly coordinating anions (WCAs). Building upon our development of the sterically demanding ferrocenyl substituent, Fc\* (2,5-bis(3,5-di-*tert*-butylphenyl)-1-ferrocenyl), we have previously reported the synthesis and structures of stable bis(ferrocenyl)germylene and -stannylene. We sought to explore the synthesis of the bis(ferrocenyl)aluminum cation, Fc\*<sub>2</sub>Al<sup>+</sup>, as we hypothesized that the cationic aluminum center would remain largely unaffected by  $\pi$ -coordination from the flanking Dtp groups. Herein, we have succeeded in the synthesis of bis(ferrocenyl)aluminum cation **1**<sup>+</sup>, a diorganoaluminum cation. Its Lewis acidity has been evaluated on the basis of the theoretically calculated FIA (fluoride ion affinity) values relative to Et<sub>3</sub>Si<sup>+</sup>. We are grateful to Prof. Wakamiya (ICR, Kyoto Univ.) for the support on the research, and fruitful discussions.



#### Presented papers (with acknowledgments)

T. Anzai, K. Sugamata, S. Morisako and T. Sasamori, *Dalton Trans.*, 2025, **54**, 1360-1364; T. Anzai, K. Sugamata and T. Sasamori, *Dalton Trans.*, 2025, **54**, 10667-10672.