# 第105回フロンティア材料研究所講演会

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場　所：東京工業大学すずかけ台キャンパスR3号館1階大会議室

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演 題：Air-stable n-type Organic Semiconductors for Thermoelectric Applications

Abstract: Developing highly conducting and air-stable n-type semiconductors have proven to be extremely challenging, despite intensive research efforts and a need for better-performing materials. Not only would highly conducting interlayers facilitate charge extraction, respectively injection, when used in organic solar cells or light-emitting diodes, but also accelerate the development of emerging plastic electronic technologies like organic thermoelectrics. Thermoelectric generators convert heat into usable electricity, due to the Seebeck effect. Constructing an efficient thermoelectric generator based on organic semiconductors however has proven difficult, primarily due to a significant shortage of suitable materials. While organic p-type semiconductors are abundant and relatively easy to dope, there is a shortage of suitable n-type materials and appropriate dopants. One approach that has proven popular in recent years is extrinsic doping of conjugated polymers. By mixing molecular dopants into a polymer matrix, it is possible to enhance the overall conductivity of the semiconductor to a certain degree, before morphological instabilities take over and cause microscopic phase separation of the dopant and polymer matrix, significantly limiting the doping efficiency.

In this paper, we will present a new approach to intrinsic organic conductors, namely organometallic coordination polymers. We will discuss how the choice of ligand and coordinating metal cation affect the electrical properties of the material and demonstrate how both the ligand and metal cation can be exploited to control the doping of the new materials, tuning the electrical characteristics to be either p-type or n-type. Contrary to extrinsically doped semiconducting polymers, the organometallic coordination polymers exhibit excellent ambient and morphological stability and could pave the way to a new class of robust organic conductors for plastic electronic applications.

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