

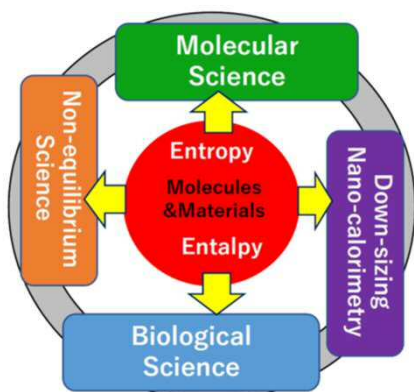
Research Center for Thermal and Entropic Science

Introduction

Materials necessary for our lives and the modern industry are assembled systems of atoms and molecules which have various microscopic degrees of freedom. They are considered as thermodynamic systems. In discussing the nature and functionality of a small number of molecules, it is necessary to consider them as a system influenced by the surrounding environment to form a thermodynamic equilibrium. Studying macro phenomena from the standpoint of their micro origin through thermodynamics and static physics is an important aspect of natural science and a problem that is related to the basis of science.

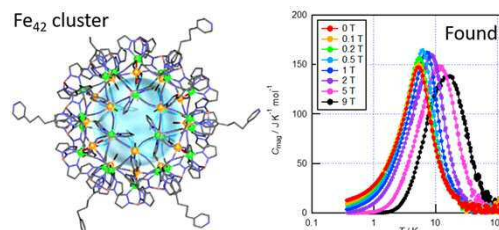
This center aims to understand materials hierarchically from the above viewpoint by performing precise measurement of thermodynamic quantity such as entropy and enthalpy and analyzing them. We are also performing their downsizing, and also developments under various external environment control. This is a fundamental research center of thermal science with extremely unique characteristics internationally that promotes the development of new substances and the development of new phenomena. We are also working on the development of original equipment for performing various thermodynamic measurements with high sensitivity and high resolution, depending on the condition and quantity of substances.

The center has various distinctive measuring apparatus and devices with their experimental and analytic techniques. The phase relation and thermal excitations of various molecular aggregates, for example, molecular magnetics, molecular superconductors, spin clusters, single molecular magnets, liquid crystals, plastic crystals and glasses. We also develop thermal science for various non-equilibrium systems such as biomolecules of proteins, enzymes, nucleic acids, polymers, solutions, nano-structure materials, etc. Collaborative researches with a number of domestic and overseas institutes are underway.

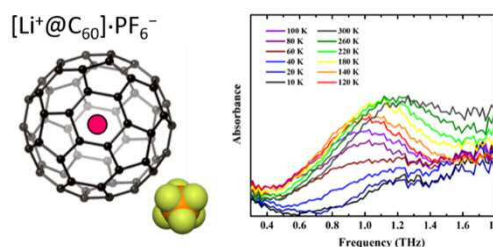


Research Projects

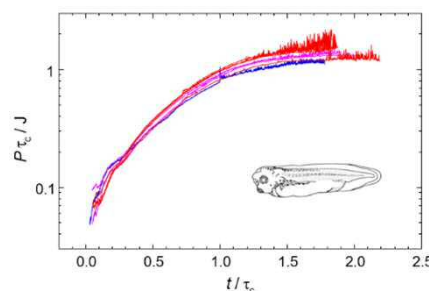
1. Thermodynamic investigation of molecule-based magnets.



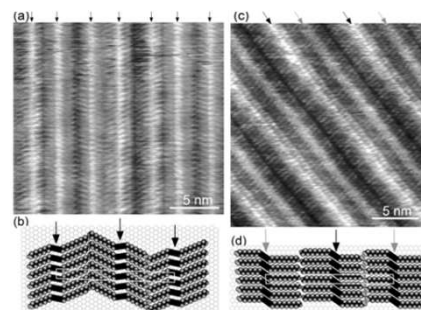
2. Motions of loosely bound atoms and molecules in Crystal



3. Thermodynamic approach to biological phenomena.



4. Structure and thermodynamics of two-dimensional solids formed at various interfaces.



5. Thermochemical approach to chemical bonds.

6. Thermodynamic approach to hydration of electrolytes and non-electrolytes in their solutions

The History and Future Scope of the Center

The “Chemical Thermodynamics Laboratory” was founded in 1979 by Prof. Syûzô Seki to study various physicochemical problems including phase transitions, critical phenomena and molecular energetics. In 1989, this center was succeeded by the “Microcalorimetry Research Center” to expand the project to wider area. The “Research Center for Molecular Thermodynamics” was founded in 1999 to explore thermodynamics of functional molecules and it was succeeded by “Research Center for Structural Thermodynamics” from 2009. In 2019, “Research Center for Thermal and Entropic Science” was founded to perform another ten years project by focusing on fundamental understanding materials and developing new materials and new phenomena occur in multi-scales in nature. The aim of the center is to dedicate to fundamental science based on accurate measurements of enthalpy and entropy. International collaboration is also significant task of the center.

Home Page

<http://www.chem.sci.osaka-u.ac.jp/lab/micro/index.en.html>

1979-1989

Chemical Thermodynamics
Laboratory

1989-1999

Microcalorimetry
Research Center

1999-2009

Research Center for Molecular
Thermodynamics

2009-2019

Research Center for Structural
Thermodynamics

2019—

Research Center for Thermal
and Entropic Science



Organization of the Center

