EDAGAWA LAB.

[Order in atomic arrangement and physical properties of solids]

International Research Center for Sustainable Materials

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Mechanical Properties of Sustainable Materials

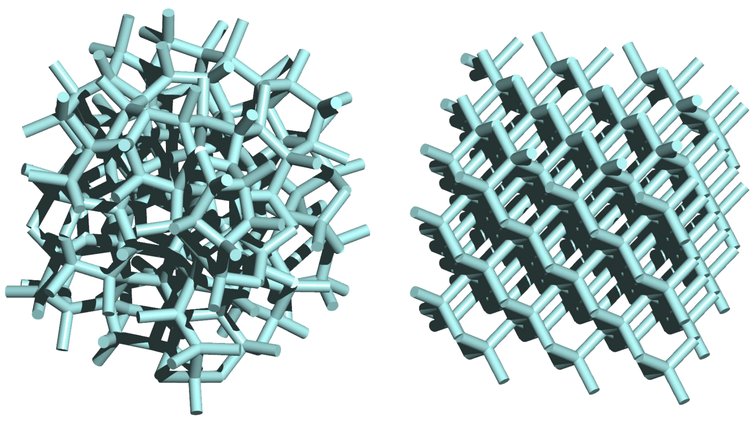
Department of Materials Engineering

Order in atomic arrangement and physical properties of solids

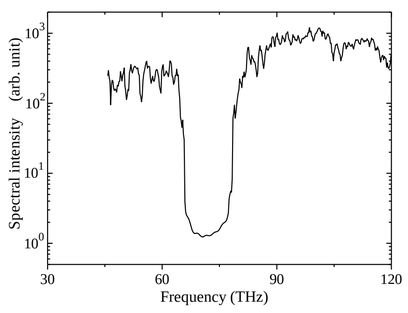
If we look into solids microscopically, we find that atoms are arranged in some ordered manner. Microscopic structures in solids can be classified in view of the atomic order into three groups: periodic structures (crystals), quasiperiodic structures (quasicrystals) and amorphous structures. Such atomic orders often determine the macroscopic properties of solids. We aim at elucidating the relation between the microscopic structure and macroscopic physical properties of solids, and also at developing new materials with desirable properties using the information obtained through such studies.

◆ Development of random network photonic devices

Discovery of an amorphous structure exhibiting a 3D photonic band-gap



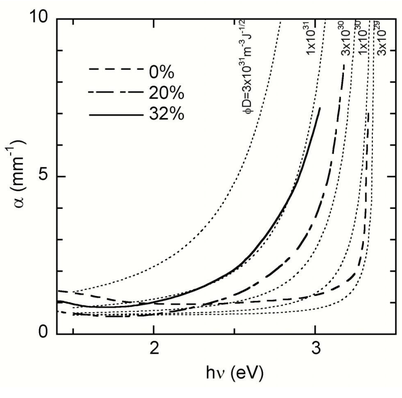
Photonic amorphous diamond structure
and photonic crystalline diamond structure



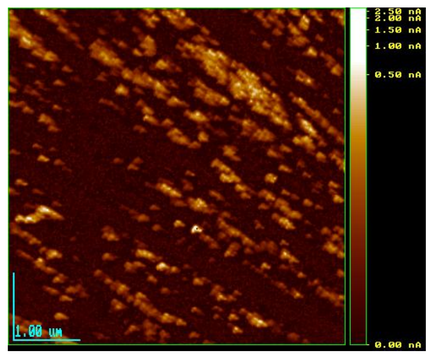
Photonic density of states
calculated by an FDTD method

Fabrication of photonic amorphous diamond structure in a microwave regime

◆ Physical properties of dislocations in semiconductors

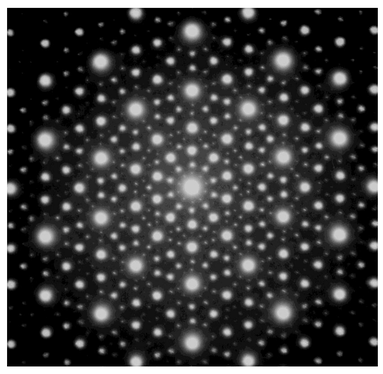


Change in optical absorption spectra by plastic deformation



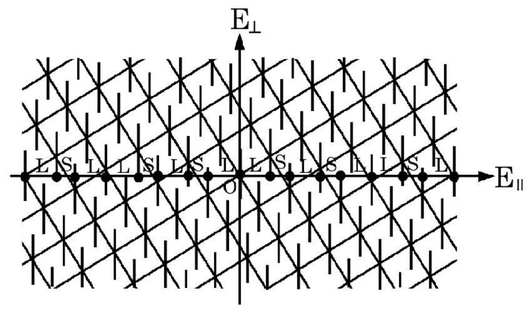
Conductive spots on surface of GaN introduced by plastic deformation

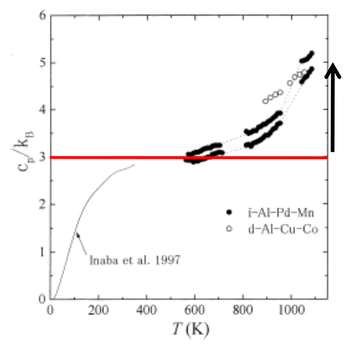
◆ Phason dynamics in quasicrystals: Elucidation of origin of physical properties inherent to quasicrystals



Electron diffraction pattern of Al-Cu-Fe icosahedral quasicrystal with the incident beam parallel to a fivefold axis

An example of a 1D quasicrystalline structure described as a section of a 2D periodic structure





Braking of Dulong-Petit's law
in high-temperature specific heat

Measurement of high-temperature internal friction