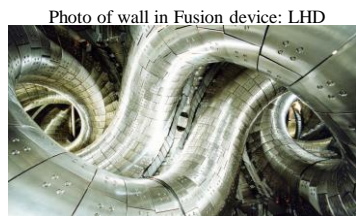


Molecular Simulation of Plasma-Material Interaction

Associate Professor Seiki Saito

Illustration

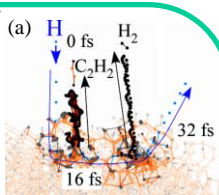
Molecular Simulation for Nuclear Fusion Device



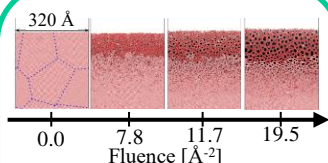
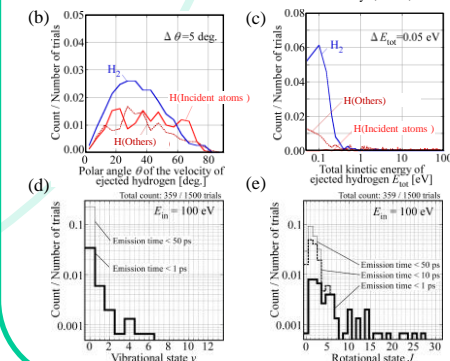
Provided by National Institute for Fusion Science

Example of the investigation of recycling process of hydrogen molecules released from the carbon wall in LHD by molecular dynamics simulation.

- (a) Atomic process of emission
- (b) Emission-angle distribution
- (c) Translational-energy distribution
- (d) Vibrational-level distribution
- (e) Rotational-level distribution



Contrib. Plasma Phys., 2020:e201900152.



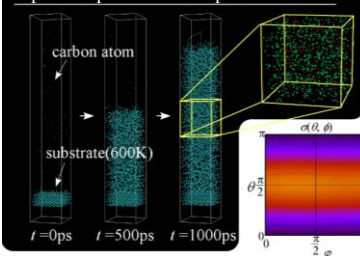
Copyright (2018) The Japan Society of Applied Physics.
Jpn. J. Appl. Phys. 57 01AB06 (2018)

Example of investigation of the bubble structure grows on a tungsten wall exposed to helium plasma using molecular simulation.

Molecular Simulation for Plasma Processing

Film formation of amorphous carbon by molecular dynamics simulation. The anisotropy of atomic bonds was investigated in atomic scale.

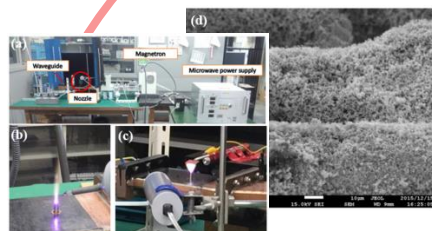
Deposition process of amorphous carbon film



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Jpn. J. Appl. Phys. 51 01AC05 (2012)

Experiments of Plasma Irradiation

Plasma irradiation experiments is performed by atmospheric pressure plasma and vacuum plasma equipment. Experimental data is compared with the result of molecular simulation.



J. Appl. Phys. 107 123306 (2010)

Content:

The complex physical phenomena caused on the interaction between plasma and materials are investigated.

Technologies that utilize the interaction between plasma and material spreads widely in our lives. For example, plasma processing technology is employed for the fabrication of semiconductor and thin film that support the information technology. The plasma-material interaction is also one of the key issue for realization of nuclear fusion power plant which confines high-temperature plasma of 100 million degrees Celsius with magnetic field or inertial force.

Various plasma-material interaction mentioned above is investigated by comparing molecular simulation with plasma experiments, in our lab.

Appealing point:

We can provide knowledge to understand macroscale phenomena related to plasma-material interaction from the atomic scale by large-scale molecular dynamics simulations using supercomputers.

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