Some preliminary thoughts on abnormal phenomena of condensed matters loaded with D/H

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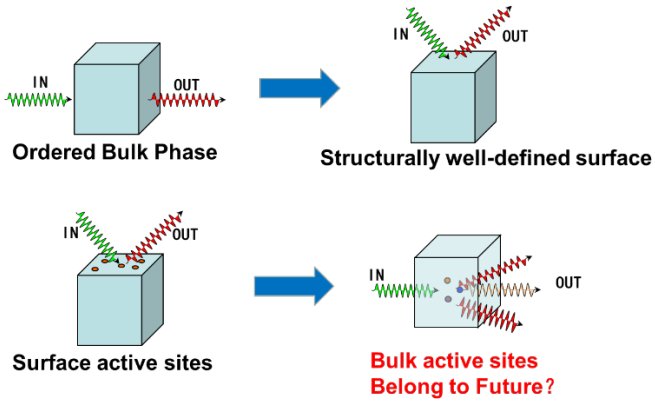
1. The threshold of condensed matter nuclear science (CMNC) is very high

Originally scientists studied condense matters by preparing and characterizing the structurally well-defined and ordered crystals (bulk phase), then the subject was expanded into structurally well-defined surfaces and the top few layers of metal and oxide crystals. It is hard to prepare and characterize the various surface facets.

For catalysis and electrochemical industries, the people have to move forward to prepare good catalysts and electrode materials. it's necessary to get the deep insight of surface reaction mechanisms. As a consequence, much more complex surfaces were prepared to rationally design and create various active sites of adsorption/reaction of heterogeneous surfaces.

Nowadays the people can study the single active sites, single atom(s) supported by metal/semiconductor/oxide/carbon—single atom catalysis (SAC) by tools with very high spatial resolution (angstrom) experimentally and theoretically.



2. Some thoughts on CMNS

- CMNS may result from some nonequilibrium processes in highly D/H loaded metals; e.g., a rapid change in the configuration of host metal atoms could create unique "CMNS active sites".
- To avoid the conflict of the loading and triggering targets, the sharp increase of temperature by the laser, current, or electro-magnetic pulses are obviously helpful because the absorbed D/H has no time to escape from the bulk phase of metal.
- Raising the temperature close to the melting point could be a way to create a special non-equilibrium state that may promote the reaction effectively.
- The small tubes with ultrathin wall, ultrathin wires or nanoarticles of metal/metal hydride are the best for these high temperature/pressure studies. For the small nanoparticles, the surfactant to protect the particle surface must be used.

- The surface contamination must be avoided and many characterization methods and tools under high vacuum condition must be developed to extract the week signal contributed from the surface.
- Not only normal condense matter but also abnormal (‘soft’) condensed matters may support nuclear reaction, which may need to have stimulated surface phonon emission or coherent shaking of surface and/or sub-surface atoms periodically. The localized anharmonic vibrations might be one of the possible ways to realize the localized excited surface phonon, which could be triggered by thermal heating, THz pumping, gas pumping or inflating, etc. The abnormal phenomena may be more distinct when the condense matter is getting ‘soft’ in a non-equilibrium state when the condense matter is input with energy flux.
- The combination of hot and cold fusion may reduce the threshold of technical parameters especially the temperature for ICF.

3. Brief Summary

- To avoid the conflict of the loading and triggering targets, the sharp increase of temperature by the laser, current, or electro-magnetic pulses are obviously helpful because the absorbed D/H has no time to escape from the bulk phase of metal.
- One of the extreme trigger methods could be the utilization of inertial confinement fusion (ICF) facility. The highly D/H loaded metal nanoparticles are filled in the target ball then it is compressed to extremely high densities and temperatures by the initiating laser beams. The sufficiently high density and temperature are achieved before the target disassembles. The combination of hot and cold fusion may reduce the threshold of technical parameters for ICF.