Role of Asymmetry

It may seem strange to approach the end of this discussion of a symmetry-based reaction model with a discussion of asymmetry. However, there is a parallel with the quantum physics of molecular spectroscopy. Simple molecules with strong infrared absorption are the ones with large dipole moments, like HCl and H_2O. Similarly, in nuclear physics, states that differ by 1 unit of angular momentum have relatively high nuclear reaction cross sections because they interact strongly with electromagnetic fields. The first step in a dd fusion reaction is a momentum transfer that occurs during a resonance scan between two energy states. Both the Iwamura CaO + sputtered Pd interface reactions and the Arata-Zhang ZrO_2 + nanoPd interface reactions have been shown to be good heat producers. Both provide a highly asymmetrical environment within which a quasiparticle deuterium many-body system can be hosted. The environment has high lattice symmetry in the plane parallel to the interface, and very asymmetric symmetry in the direction perpendicular to the interface, as shown in Figure 3.8,1.

There are in-plane momentum shocks which are generated when migrating deuterons transition from a localized chemical-form to a delocalized quasiparticle form, due to an essentially instantaneous shift in center-of mass. In the oxide-nanometal systems, there are also shocks that are produced in the direction perpendicular to the crystal-metal interface plane. Independent of any fusion reaction shocks, when a deuteron transitions from chemical orbital form to quasiparticle form and suddenly spreads over an interface area that provides 1000 potential wells, it suddenly imposes a jump in deuteron positive-charge density within the interface volume. In response, a 0.001 fraction of an electron quantum-of-mass moves from the metal's fermi sea and enters each unit cell of the same interface volume. The charge neutralization process is called "dressing". The Pauli exclusion principle applied to electron matter requires a sudden jump-increase in the thickness of the interface. This thickness increase forces an "instantaneous" recoil of the adjacent metal relative to the more incompressible bulk oxide crystal.

The migrating deuteron has created an asymmetrical recoil motion which is analogous to the momentum shock that occurs when a many-body solid-state system recoils as a unit during a momentum transfer between two contacting systems. Such momentum recoils are known to occur between crystallites and hosts during the radioactive decay of certain iron nuclei. The phenomenon is called the Mossbauer effect. It is a recoil effect that was discovered when a particular type of iron was hosted inside a solid crystallite. In the Mossbauer effect, the gamma ray emitted from a recoiling radioactive iron nucleus within a crystallite is resonantly absorbed by a non-recoiling non-excited atom of the same iron type located in a second iron hosting solid material, but only if the two systems are physically moving slowly apart at the right relative velocity. The gamma ray then sees a momentum match and is absorbed.

In cold fusion reactors, the asymmetric momentum shock has a different origin and different form from that produced by a Mossbauer momentum recoil. The shock that occurs when a migrating deuteron changes its geometry has an acceleration-deceleration form. It produces a back and forth energy scan between interface and metal host, caused by a back and forth velocity spike. The resulting energy scan appears able to trigger Step 1 of the nuclear reaction process.

Momentum shock events of this type require that deuterons move inside the metal. This need for migrating deuterons seems to explain the reaction stimulation that accompanies deuteron fluxing, as specified in McKubre's empirical law based on his cold fusion heat observations.

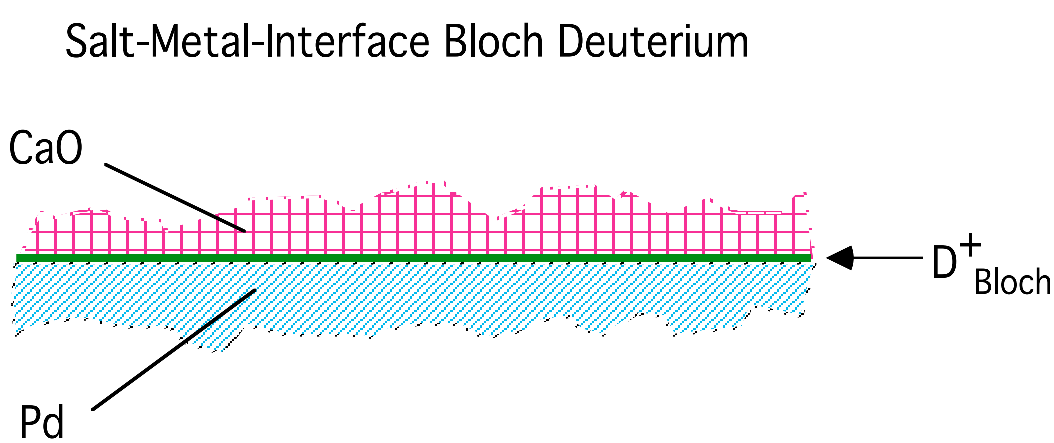

Figure 3.8,1 Asymmetric interface used by Iwamura's group in excess heat observations in 1999. The quasiparticle deuterium which occupies the CaO Pd interface is labeled D^{+}_{Bloch} . The interface provides an environment that enforces 2-dimensional periodic lattice symmetry within the interface plane, and asymmetric symmetry perpendicular. Entry of a deuteron into the interface volume creates a momentum shock perpendicular to the interface due to Pauli exclusion operating on the neutralizing electron matter. The shock

provides a momentum scan that aids collapse of quasiparticle deuteron pair to nuclear dimension. This collapse is Step 1 of the nuclear reaction process