Construction of a variable micro-nano-gap instrument for chemical reaction studies and mimicking of possible NAE like structures

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Scanning tunnelling microscope is a versatile instrument to study surface atom structures and surface electron structures. The principles of its operation can be used to develop a variation where two surfaces of micron scale are brought in very close proximity of few atom lengths to each other.. There are many technical challenges involved in such construction that will be reported. Experience in unconventional STM construction [1-3] will be used in this case.

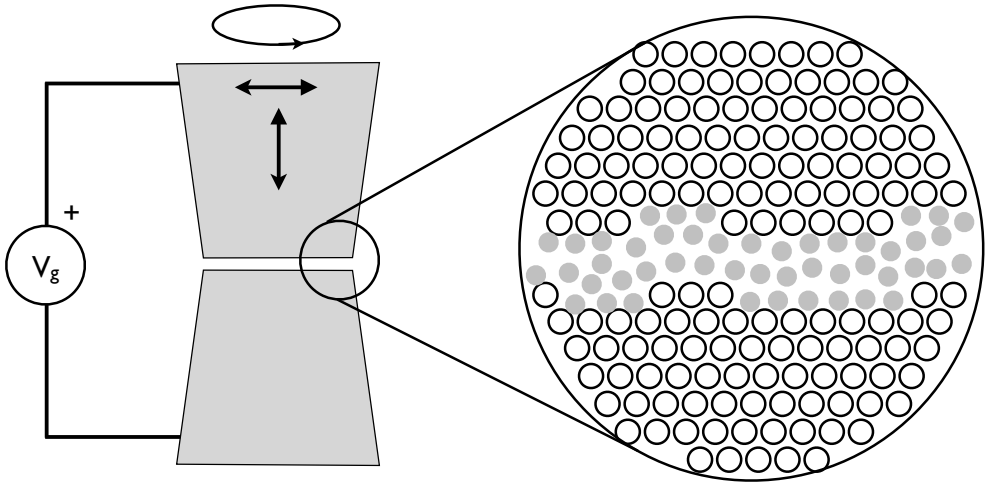

Fig 1. Two microns sized wire ends with mirror like surfaces are brought in alignment of each other in a gas or liquid environment. The wire ends can be moved or vibrated relative to each other on atom scale dimensions.

The most stringent requirements of such instrument will be to be able to create in-situ two surfaces with mirror like surface to be able to reach the shortest gap size (1-5 atoms) without making contact over large are of few microns or even lager areas.

There has still be no experiments in surface science to the authors knowledge were such gaps are exposed to reacting gas or liquids when the gap is slowly reduced and conductivity across the gap is monitored to avoid crashing. There has therefore been no study of the nature of Hydrogen/Deuterium gas that is chemisorbed and is in thermodynamic equilibrium with two Pd hydride surface wire ends. Will there be a gap distance in which H-atoms are not found as bound H_2 molecules but as a lattice of H-atoms. This could be monitored with conductivity measurements. To study this preliminary DFT calculation will be done in order to check this stability limit.

In addition to this means to include in the design radiation detection and caloric measurements will be contemplated and discussed.

References

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