

## Nano-Nuclear Science An Overview of an Unexpected Phenomena

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Twenty years ago Professors M. Fleischmann and S. Pons, at the University of Utah, announced they had discovered evidence of excessive exothermic reactions with a palladium cathode undergoing heavy water electrolysis. Their calculations showed the observed reactions exceeded the energy of known chemistry implying a nuclear phenomena that the press rapidly coined “cold fusion”. However, many laboratories throughout the world were unable to replicate the findings. Within a year, cold fusion was deemed dead. Since then, not only was excess heat sometimes reported, but occasionally, the apparatus melted! Peer reviewed papers reported on tritium, transmutation and energetic particles. Excess heat was linearly correlated with helium-4 “ash”. Multiple papers describe conditions under which a heavily deuterium loaded palladium lattice will produce correlated heat and helium-4, and, under different conditions, charged particles and neutrons consistent with hot fusion deuterium-deuterium and deuterium-tritium fusion reactions. High-resolution X-ray and gamma ray spectroscopy have provided insight into the detailed mechanisms. Although there are configurations that reliably produce energetic particles or heat all of the time, but there is no adequate theory for the observed results.