# Electrochemical-Physical Activation of Nickel-Cathode Surfaces

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Experimental evidence for low energy nuclear reactions (LENR) is based mostly on measurements of excess amounts of thermal energy that are generated during the electrolysis of heavy water using palladium cathodes. These excess thermal energy events, however, cannot be explained by established electrochemical energy balance considerations. This experimental investigation focusses on finding root-causes for such thermal events rather than measuring the events. In order to gain insight of macroscopic physical electrode behavior, cathodes of nickel in light water electrolytes are used as practical models for metal-hydrogen systems to investigate the mechanics of gas evolution. The surface microstructure of electroplated nickel cathodes was the initial object for the investigation of hydrogen gas bubble formation. During these studies a surprising physical cathode-surface-effect was observed at the onset of gas evolution periods. The observation of this effect has not been found -and reported on- in the scientific literature for the nickel-hydrogen binary system, even though this system has been investigated intensely for nearly a century. The readily produced physical effect, observed at the surface of nickel cathodes, leads to the conclusion that during hydrogen gas evolution metastable surface-lattice conditions are created, which lead to, and explain, the initiation of surface phonons that are part of possible causes for LENR thermal events.

In the description of the experimental investigation, cell configurations, electrolytes, preparation methods, cathode surface structures, and physical behavior of cathode surfaces are given. The methods for producing the electrochemical-physical cathode activation effect, detailed observation of the effect, and its potential relationship with other metal-hydrogen systems, are described. Also, an attempt is made to interpret the results of this model-study in order to obtain an understanding of the reasons for poor reproducibility of LENR-thermal events by independent investigators, as well as, explaining thermal event observations (by others) such as “after death” excess heat generation on palladium-deuterium cathodes.