First results on coaxial-coiled thin Constantan wires, by electromagnetic excitation of very high-power density and high voltage pulses, at microsecond time regime.

#Francesco Celani[1,2,4], C. Lorenzetti[1], G. Vassallo[1,3], E. Purchi[1], S. Fiorilla[1], S. Cupellini[1], M. Nakamura[1], P. Cerreoni[1], R. Burri[1], P. Boccanera[1], A. Spallone[1,2,4], E. F. Marano[1].
(1) ISCMNS_L1, Intern. Soc. of Condensed Matter Nuclear Science, Via Cavour 26, 03013 Ferentino-IT; (2) EU Project H2020: CleanHME; (3) DIDI, Univ. of Palermo, 90128 Palermo (PA)-IT; (4) Istituto Nazionale di Fisica Nucleare, Via E. Fermi 56, 00044 Frascati (RM)-IT
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E-mail: franzcelani@libero.it INFN-LNF, Via E. Fermi 56, 00044 Frascati (RM)-Italy

In the framework of LENR-AHE (Anomalous Heat Effects) studies we focused, since 2011, on innovative, low-cost materials instead of the usual, precious-metal, Pd. We found that the Cu-Ni alloy, also used for J-type thermocouple construction, has the peculiarity of easy dissociation of H_2 (or D_2) from molecular to atomic state, at enough low temperatures (150 °C), and to keep it inside the lattice and/or at surfaces, up to temperature of 700-800 °C, even at low gas pressures (few bar). Because long time experience (since 1994) on thin and long wires geometry of the electrodes, we concentrated our efforts taking advantages of such specific shape, specially from the point of view of electromigration of ab/adsorbed H, under proper longitudinal electric field (0.5-1 V/cm), DC and/or pulsed. On 1995 we got noticeable results using Pd wires in electrolytic environments (D_2O) at mild temperatures (40-60 °C). Later-on, in some experiments, we used even gaseous environments at high temperatures (up to 700-800 °C). Main problem of Pd was its large brittleness after H, D absorption. Moreover, we experimentally reconfirmed that one of key condition to induce AHE is the "flux" of H moving inside its lattice (longitudinal) or through the surface (transversal). Pioneers of transversal flux were G.C. Fralick-NASA; M.K. Kubre-SRII-USA, Y. Iwamura-MHI-J, Y. Arata-Osaka Univ.-J We focused on longitudinal flux (following the theoretical models developed by G. Preparata-Milan Univ.-I), although our unconventional electrolytic experiments (1995-1998) had both.
Anyway, apart the initial state, the flux needs external energy to be continuously activated because, in our experience, AHE are due to non-equilibrium conditions, i.e. are needed continuous stimulations, usually energy consuming, apart some specific (but delicate) geometrical set-up (like Capuchin knot in some of our geometrical arrangements).
Recently we developed an unconventional geometry of the electrode aimed to use, at almost the same time, longitudinal and transversal flux at high temperatures in gaseous environments: our goal is to minimize extra energy added, to maximize the AHE and keep it operative for time as long as possible. At ICCF22 we presented results obtained using Constantan wire arranged as *reversed coaxial coil* with inner electrode made by Fe tube. The thin Constantan wires had the surface treated to make them at submicrometric dimensionality and covered by a mixture of Low Work Function (LWF) materials. We observed that the time span of AHE was increased just by activating the wire surface by mild sinusoidal High Voltages (50 Hz, up to +-600 V, few mA), while the coil was DC powered to get both DC electromigration and proper high temperatures (>600 °C). The activation was effective mainly at low gas pressures, where the Richardson regime is possible. The Fe counter electrode operated mainly as electron donor, thanks to high voltage (Child-Langmuir effect) and low pressures. Because low pressure, over time, we observed an excessive de-loading of the H from the surface of the Constant, until the AHE vanished. So, to keep the AHE, some proper amount of H_2, i.e. enough large pressure (some hundreds of mbar), is needed. The effect is improved if the gas is ionised, i.e. Paschen/DBD regimes. Considering all such requirements we designed such coiled coil able to operate at high voltage in *pulsed* conditions: we could get, at the same time, very high values of electromigration (pulsed condition), large temperature because longitudinal current, transversal excitation i.e. flux, because gas ionization at mild pressures (high voltage), Richardson regime (for short time) just reducing gas pressure, all properly compatible with peculiar Paschen behaviours.
We will explain the specific set-up and summarise the recent results obtained, also considering the severe stress of the system: High Voltage, High Pulsed Power, High Frequency, High Temperatures.