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# Progresses on understanding LENR-AHE effects, using thin and long Constantan wires multi-elements coated, under $D_2$ gas mixtures at high temperatures, by DC/AC Voltage stimulation in coiled coaxial geometry.

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Our group has been studying LENR phenomena in Constantan ($Cu_{55}Ni_{44}Mn_1$) since 2011. In fact, this alloy captured our attention since it promotes efficiently the dissociation of molecular Deuterium ($D_2$) or Hydrogen ($H_2$) to the atomic state, followed by a remarkable absorption capability. Under certain conditions, this absorption is associated with exothermic phenomena exceeding by orders of magnitude the enthalpy of conventional reactions. Constantan is also much cheaper than Palladium, has better mechanical properties and it is found in an ample variety of applications. Similarly to the better studied Palladium, the occurrence of anomalous heat effects (AHE) in Constantan requires a loading with Deuterium or Hydrogen and conditions of non-equilibrium. When the latter are absent, AHE is either reduced or tend to decline with time. This observation led our group to investigate ways to increase non-equilibrium conditions. From 2016 we studied in particular the effect of surface modification of the Constantan wires with coatings comprising elements able to modify the absorption behavior (i.e. Fe) and oxides with low work function. We also developed certain geometrical arrangements of the wires (knots, capuchin knot and so-on) in order to induce local thermal gradients and hot-spots. Moreover, the polarization of the wires (initially as cathode) with a power supply proved to be a versatile approach to induce non-equilibrium conditions and AHE. In that respect, we have speculated that the electron emission from the wires may induce the movement of active species (similarly to the **Richardson** effect – data presented at MIT in March 2019). This hypothesis seems to be confirmed by the more recent finding that both the polarization of the Constantan as cathode or anode produces some AHE stimulus. The study of alternating currents followed (50 Hz, 600V), and proved to be an effective trigger as well. These results have been presented at the *ANV Meeting* in Assisi (17-19 May 2019), where we anticipated the findings of this presentation. In particular, we reported a remarkable AHE increase at reduced pressure, when a gas discharge closely matching the **Paschen**-law occurs. Because of the promising results with the AC fields, we assembled the wires in a different geometrical configuration, with the aim at maximizing the gas discharge phenomena (i.e. dielectric barrier discharges). This new geometry comprises a Constantan wire with a coaxial counter electrode (a Fe thin tube insulated by $SiO_2$ sheath). The Constantan wire is inserted inside a sheath comprising glass Type_e and $SiO_2$-$Al_2O_3$ fibers, and then coiled over the Fe counter electrode ($\Phi$=6mm) while keeping as low as possible the distance between the electrodes (<2.5 mm). The presentation discusses the results obtained with the new assembly and the effect of AC stimuli with Constantan wires of different thicknesses ($\Phi$= 200, 350 μm) and length of 170 cm. The Constantan wires were studied up to 750 °C and gas pressures ranging from 100 up to 2500 mbar.