Total requirement for producing water suspended nano silver using electro-photochemical strategies.

INTRODUCTION:

Of all of the possible methods to produce so-called colloidal silver, only one methodology is capable of producing a consistent and predictable outcome of water suspended neutral silver utilising simultaneous oxidation and reduction using just direct current and photonic energy at a very specific spectral violet wavelength. That wavelength occurs at 420nm at 2.95eV. The term most often used: Photon Electron Transfer. The equipment used for this is relatively simple and detailed as follows:

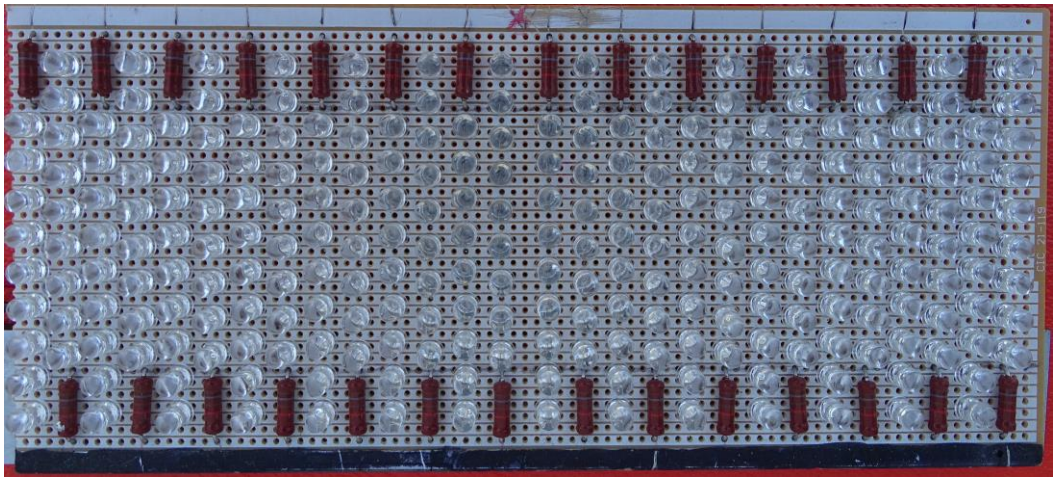
1. A normal 240VAC to 12VAC stepdown transformer and coupled to a reverse connected 12VAC to 240VAC step-up transformer. Both the secondary outputs, i.e. 12VAC and 240VAC are full wave rectified and provide 16.8 volts DC and 336 volts DC potentials smoothed out with appropriate electrolytic filter capacitors respectively. The 16.8 volts DC is used for the actual driver circuit components and the 336 volts DC will be the voltage potential in the load circuit. 110VAC systems will only provide 154 volts DC and will require a voltage doubler circuit in order to obtain the 308 volts DC. Naturally the current rating will need to be commensurate with the expected loading.

2. The driver circuit consists of a small NPN transistor controlling a heavier duty high voltage NPN transistor with an isolation between its collector, base and emitter of at least 600 to 900 volts DC to prevent any electrical breakdown. The circuit chosen is both a current regulator and limiter that would provide a maximum of 500 micro-ampere to flow in between the silver cathode and silver anode even with a separation of at least 200mm submersed in deionised water.

3. Preferably a rectangular tank made from borosilicate glass (PYREX or something similar) or acrylic (PERSPEX) large enough to be able to spread out the two electrodes 200mm and at least 25mm distance from the walls of the tank. Too large a tank and too large a volume in water will require too long a period of time to produce a relatively small concentration. As some indicator, 500 micro ampere in 4 litres of water will produce a concentration of approximately 10ppm (10mg/litre) over a period of 48 hours non-stop.

4. A substantial matrix of around 200 normal sized violet light LEDs as 20 rows in series/parallel, drawing 20mA per row of ten mounted on a printed circuit board (PCB) Each of the 20 rows of ten LEDs has a small resistive trimmer in series to set the 20mA current exactly. Violet LEDs usually have a wavelength output of between 417 and 420nm.

Note 1! Unknown to many people, violet light at 420nm equates to 2.95eV and is considered an ionising frequency and in some ways harmful, in particular the eyes. Great care at all times is warranted.



Matrix of 28 parallel rows of 9 violet LEDs wired in series making for 252 LEDs on an area of 250x100mm OCB. Instead of having rows of 10 at 3.5 volt =35 volt, columns of 9 allow for 4 volt per LED = 36 volts in total and within the limit set by the LM317T voltage regulator.

5. A low voltage power supply (PSU) will need to drive the rows of ten LEDs with enough of a voltage potential, which for most normal violet LEDS would be 3.5 to 4 volts DC. For ten that would equate to 35 to 40 volts. Since the most common Voltage Regulators such as the LM317T can only process voltage potentials of maximum 37 volts at 1.5 ampere of current, some trade-offs in the final supply voltage must be tolerated. There are ways of doing that but that will require more complicated circuits and presently beyond the scope of this brief.

6. The conditions for electro-photochemistry are:

6 a. No other light during production

6 b. Use of a domestic or industrial refrigerator set to between 4 and 10 degrees Centigrade.

7. A brief description of the electro-photochemical process:

When activated, a voltage potential of either 336 or 308 volts DC across the two electrodes will stimulate an electric current of 500 micro ampere to flow from cathode to anode. This will strip silver atoms from the anode that will lose an electron and turn the incomplete silver ionic, which will dissolve in the water and travel to the cathode by attraction. A silver ion is a cation and has a positive charge. The electron that has been removed is now called a hydrated or solvated electron and held captive by the water molecule cluster formations until a collision with a high energy photon at 420nm creates a release. A photon-electron is created. If successful and a silver ion is floating by on its way to the cathode it will reduce the silver ion into a neutral atom. This is still an unstable situation until the next step when two such atoms in close proximity form a so-called dimer and a co-valent bond between the two is established. The reason for the 200mm distance is for the sole purpose of delaying the ionic silver to reach that cathode. This process will produce nano sized neutral silver atomic clusters at sizes ranging from around 3nm to 10nm and a denser concentration at between 5 and 7nm.

More information will be added in the future.

Note 2. All equipment described must be double insulated so that no electrical contact can be made. The only are of concern would be the electrical connections of the electrodes and must be connected with equipment such as the power supplies disconnected from the mains supplies. The on-board high voltage electrolytic capacitors would store the 336 or 308 volts DC and would have a capacity of between 33 and 120 micro farad or higher. That is quite a charge and may prove fatal if touched. For that reason alone all equipment will need to be electrically approved and tested for compliance to regulatory authorities.