## SENSITISING – heliogravure

Once the file has been printed over the specific chosen film, it is now necessary to put this image in contact with the sensitised Carbon Tissue and after exposure transfer the gelatine layer onto the copper plate.

The sensitive molecule to U.V. light is a chromium salt, as traditional sensitiser for photographic non-silver techniques: the potassium or ammonium dichromate $K_2Cr_2O_7$ or $(NH_4)_2Cr_2O_7$. The choice matters since their reaction to radiation is not the same (1).
Remember that the handling of chromium salt ($Cr^{6+}$) must be constantly and with the utmost care object of attention, because of its dangerousness ... for the operator himself and for the environment. ANY trace or dripping outside of the used containers must be recovered for proper disposal.

The spreading of the salt solution onto the gelatine layer, is described in the dedicated literature (and on the *web* too), suggesting to dip or float the C.T. sheet in a bowl filled up of the chromium solution, for a few minutes. Here, contrary, it is strongly recommended to use a minimum and known quantity of the solution and to spread it on the C.T. with a very soft brush (free of metal parts beeing $Cr^{6+}$ strongly oxidising) until it is completely absorbed.

In the first case there are inevitable drips, both during the immersion and lifting of the paper, in filling and emptying the bowl, in the evaporation of the large surface of liquid exposed to air with variations in salt's concentration, in the need to rinse the bowl (with liquid recovery for the correct treatment of hexavalent chromium), in the cleaning of materials that come into contact with the salt such as pliers, gloves, backing paper towel … or worse fingers.

An alternative way is to take a known volume of sensitising 5% solution from a small flask (let's call it '*stock*' solution) (2) and place this amount in a container suitable for dipping the brush! There will be no waste and the only leftover solution will remain firmly on the brush, which can be cleaned in the same small container, from which to recover all the chromium salt, in little volumes to stock.
Another not insignificant advantage operating in this way, instead of performing the immersion in a bowl, is that of being able to '*dose*' precisely the Cr salt absorbed in the gelatine (grams /$dm^2$ x 100) and therefore predict the behaviour of the sensitive layer with regard to the reproducibility of exposure time and linearity of the curve (see, in ***'Bichromate Sensitivity'*** page, '*CONCENTRATION* > *contrast*' section).

Here is the procedure (boring description, but elementary execution):
from a formerly prepared *chart*, we get the volume to pick up from a stock salt solution, necessary to cover the surface (in $dm^2$) of the C.T. . This quantity is brought '*to volume*' adding distilled water – as described below. So diluted, the liquid is spread onto the sheet secured on a flat surface, brushing back and forth, with a light touch so as not to scratch the gelatine layer – that with this wetting swells and softens – in every direction until all the liquid is absorbed uniformly. Let a minute to ensure an even distribution inside the layer and then place the sheet to dry, horizontally, in a suitable place (3).
Spreading is performed in weak and indirect light: the chromium salt acquires sensitivity in drying.

The '*chart*' will be drafted to suggest the volumes to pick up from the stock solution – in the assorted sizes of C.T. – to achieve the desired final percent concentration of sensitive salt on the dry paper (see beyond).
It is to be noted that the volumes coming from the 'stock' are always small and the risk is

that a fair amount of the fluid remain on the brush, with an uneven spreading on the sheet! To avoid this, one should estimate a suitable volume of liquid – at least 3 cc/dm$^2$ – reached with the aforesaid addition of distilled water.

***Example:*** *to cover a sheet 20x25 cm (5 dm$^2$) of C.T. with dichromate from a 5% (stock) solution and reach in the gelatine layer – after drying – a concentration of sensitiser of 2,5% (4), I take 5 cc (or grams) of liquid out of the flask. I think - with good approximation - that to spread with uniformity the 5 dm$^2$ of surface, I need 15 cc of total liquid. Therefore to the 5 cc 'stock' I add 10 cc (or gr.) of distilled water. This total volume, once fully applied, and beeing the brush almost empty, will give the desired final concentration of sensitiser on the substrate, as all the salt contained in the 5 cc 'stock' will be distributed on the C.T. evenly, because of the added liquid.*

*If the sheet is 30x40 cm (= 12 dm$^2$), I would take 12 cc out of 'stock' flask and add "about" 18-20 cc of distilled water, so as to reach the same volume for each dm$^2$ to coat. It is understood that the exact amount of total liquid is not relevant as long as it is entirely absorbed by the gelatine and it is always the same amount for the same surface area.*

To achieve a higher concentration of sensitive salt on the C.T. – this will change contrast and sensitivity of the layer (5) – a greater quantity of liquid is taken from the stock and a smaller amount of water is added, to keep balanced the volume. So for each coating, the same liquid (per dm$^2$ !) needs to be 'evaporated'.

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*NOTES*

*1). According to the authoritative J. Kosar - Light Sensitive Systems, the sensitivity of ammonium dichromate is 35% higher than that of potassium dichromate in mixture with animal 'colloids'; even more so for arabic gum, vegetal. This means that here we can reduce exposure by about 1/3 using the ammonium salt.*

*2) $K_2Cr_2O_7$ for the same weight contains a little less $Cr^{6+}$ compared to $(NH_4)_2Cr_2O_7$ (a '**mole**' of the two salts does not have the same weight in grams). So – for the same weight – the first salt will give a sensitivity even lower. This further complication can be avoided by maintaining constant weights and volumes with our standards. Also see footnote (2) in **'Sensitivity of Dichromate'** page.*

*3) The drying phase will be performed again in a standard way, placing the sheet – gelatine up – in a dark and dust-free place, weakly heated by a flow of air (≤ 30°C) to accelerate the process. A hygrometer will allow to respect the residual moisture in the sheet and/or a thermometer will give constant control of the treatment. The operation takes a few tens of minutes; to accelerate evaporation, the aforesaid liquid added to the 'stock', may be partly water and partly ethil alcohol or acetone. In drying, the tendency of the sheet is to curl strongly; leave a humidity content between 60÷80%.*

*4) I do not dwell on how to perform the calculation (nor on how to fill in the chart!) but I just point out that a concentration at 2.5% final on dry sheet, perfectly compatible with a 'medium contrast grade' of the T.P., means 0.025 grams of salt for each dm$^2$. A good basis to organize calculations and practice arithmetic. ... "Per aspera ad astra"!*

*5) About the sensibility variations of dichromate with the conditions of use (wavelength, contrast, humidity, exposure times, ...) refer to "**Sensitivity of Dichromate**" page.*