THE COATING (Bichromate Gum)

In the 'gum' process, coating the paper with the sensitised arabic gum solution, is a step that requires a few considerations, in addition to those related to the preparation of the mixture.
A regularity of execution — even if not a difficult passage — is acquired by repeated practice to get smooth results.

The paper, prepared as mentioned (http://www.heliogravures.it/img/The-PAPER.pdf), must be fixed upon a plane; the sensitised solution must be sufficiently fluid until the coating is complete.

It has already been said how testing the viscosity of the stock gum solution is essential and here we see how this feature affects the coating. Once the concentration of Cr^{6+} to obtain has been decided and so the required ready-to-use solution amount without waste (1), the sensitiser plus a certain volume of water and dye or pigment will be added to the stock gum solution to get the proper overall weight (2) . ...

Ex .: Let us make three copies of the same image 20x30 cm:
the surface to be covered is approximately 18 dm^2;
the Cr^{6+} concentration I want to achieve is 3% or 4%.
According to my coating procedure, I shall prepare (about) 10 grams of sensitised solution.
To do this I will mix, while stirring:

3% Cr	***sensitiser concentration***	***4% Cr***
3,0 gr	*stock gum solution (≈ 40%)*	*3,0 gr*
1,5 gr	*Cr^{6+} stock solution*	*2,0 gr*
2,0 gr	*dye*	*2,0 gr*
3,5 gr	*H_2O*	*3,0 gr*

TOTAL 10 gr. (3)

Note how between the two preparations the amount of sensitised solution changes inversely to the added water. This is always necessary to keep an unvaried dilution (= viscosity) for the ready-to-use solution.

The mixture thus prepared – stirred homogeneous with ease by the wonderful magnetic tool cited in the preparation of the gum stock solution – is set close to the sheet of paper to coat, plus two brushes (4). Then, in the indirect light of a bulb, the first brush – COATING – is dipped and dripped on the edges of the solution vessel. You will start moving it on the paper in close strips, in a single direction, so as to cover the whole surface that shall receive the image, then in a perpendicular direction and again in the previous way to smooth some thick stroke: see http://www.heliogravures.it/gomma.htm , clicking "mush" and "spread" in the text.

At this point about 20 seconds will be mentally counted: the loaded brush must absorb the ENTIRE amount to cover the sheet, without re-loading it.

Now the second clean brush – FINISHING – is grasped and the surface is run three more times as above, to remove the excess and to smooth any streaks: maximum time 15 seconds, decreasing pressure as you run. You will feel under your hand that the coating — thinning out and starting the water to evaporate — will begin to 'hold back' the brush; for this reason the movement must be speeded up while reducing the pressure. The sheet is left to rest for a few seconds, to allow the whole stuff to spread out. Part of the sheet may remain white, leaving a margin around the image.

The need for such a detailed description will be clearer when you verify how many precious sheets, patiently prepared, will reach the bin because of a miserable coating.

At this point the sheet must be placed for a few minutes in a suitable dark place, mildly heated and indirectly ventilated, facing a hygrometer. If you do not intend to make a 'multiple gum'

print, a hair dryer can be used directly on the sheet, otherwise it is important to check the humidity level of the paper itself, which will have to go back to its previous sizes in the following coatings, in order to have a perfect 'register' setting (5).

After the exposure (6), followed by the 'stripping' (stuff for another rambling!) and drying, one or more further coating will be carried out if planned as for 'multiple gum' print, repeating what above-said, possibly with a different dye, to overlap shades or change the sensitiser concentration and/or exposure time, to enhance the tonal range. ... We have already pointed out the countless potentials and acrobatics of the various stages and how these affect the final result. We may decide their consistency.

a.m.

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(1) The stock Cr^{6+} solution is 20% w/v while the used chromium concentration is achieved when preparing the coating mixture. This final concentration - from 1% to 5% - will result in a different contrast range on the print. In particular: the lower the concentration the greater the contrast provided to the image and the longer is the needed exposure times. Vice versa in higher concentrations: exactly opposite to the Ag photo-paper grades! As a guide, the exposure for the ammonium salt $(NH_4)_2Cr_2O_7$ grows roughly + 80% with salt concentration from 3% to 4%.

(2) Since the stock gum solution must be weighed in any case because its viscosity makes it impossible to dose small volumes, everything is indicated by weight for ease of understanding and execution: it is better to use a ± 0.1 gr. scale set to weigh all the stuff to be mixed and add everything in a single container. In diluted solutions (few%), 1cc worth 1gr; the dye is measured by weight if it is liquid or in paste, in 'drops' if highly concentrated ... Some tests will tell you the amount of a certain dye that the gum can hold without soiling the edges of the paper or the lights of the image indelibly penetrating into the paper's fibres.

(3) A chart specifically prepared will obviously be more extensive and complete. It is highly recommended and it must concern formats, concentrations, quantities of liquids and standard sizes. Calculations cannot be performed preparing the coating, which requires its own attention; you have to know what you have to do … written black-on-white in a plain and clear way. The quantities prepared will be the minimum to avoid waste sensitised solution on account of its danger level. The Cr^{6+} to be carefully recovered for disposal, will thus be only that of cleaning brushes and containers. The above numbers are reasonably real: a 20x30 cm print is covered with about 3.5 - 4 gr. of sensitised mixture, including what remains on the brush

(4) As brushes, that must be without metal chips to avoid reactions with chromium salt, I recommend 'mohair wool pads' https://bionaturalstore.com/it/accessori/1115-tampone-lana-mohair.html (for Italy!). They are sold both in rolls or flat. The latter can be easily cut out of the desired size, mounted on a backing, to allow an easy grip. A great convenience too is being able to test how much liquid they can hold without dripping, since this amount is instantly associated with the size of the sheet to be covered, without failing.
For example, with one of these brush/pad with a surface of 30 cm^2 (3x10cm), a 35x50 cm sheet is easily covered in less than 20", without need to re-load the brush. Moreover, the fineness of the wool hairs, provides a very even coating. As FINISHING, a smaller pad can be used. Tools must be perfectly cleaned at the end of the job as the sensitiser, if left to dry, hardens inexcusably the brush.

(5) To 'register' the film onto the sensitised sheet, the corners of the film frame or the film itself, are punched. Then the same spots are 'smeared' on the paper with the sensitive solution in such a way that exposure let 4 small round marks as a guide for the following exposures.
But more than a thousand words, ... in the website 'dichromated gum' page-text, click 'pushpin holes'.

(6) The exposure should be conducted with a perfect contact between films and C.T. This is achieved either with a reliable pressure given from the crystall on the exposure bed, or - better - through a real UV screen printing unit, with a vacuum table. The UV light source can be either fluorescent, or a mercury-lamp, but ultraviolet LED sources nowaday are available. Exposure times are generally a few minutes.