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ARTSCHOOL_SAFETY ABOUT-NONTOXICPRINT COLORLAB

Starch-based Serigraphy

SHARE CONTENT | SEARCH

by Maurice Kahn

Water-based Silkscreen Printing using Acrylics

Green T-Shirt Printing

My research into 'safe' serigraphy began ten years ago, in April 2001. Nine months later I formally announced the establishment of the 'sadna yeruka' (green studio) at the Bezalel Academy of Arts and Design in Jerusalem, Israel, having developed a workable, though less than perfect, starch-based screen printing technology. At least I had managed to eliminate all toxic, mutagenic and carcinogenic materials from my studio at that time.

Not only was my research costly and time consuming, I had to cope with negative, sceptical responses from my colleagues who considered such research irrelevant. However good my starch-based screen-printing technology was, or would become, there were those incapable of perceiving it to be valid. Could it be their fear of change? Quoting my friend and colleague, Professor Keith Howard, who emailed me the following after I mentioned to him the difficulties I was experiencing trying to get my fellow lecturers to cease using nitric acid and Kodak Printed Circuit Resist in the intaglio studio, incidentally materials they still use to this day! Though written years later, this is relevant to the problems I faced a decade ago. Keith wrote:

'Our toxic colleagues are so stuck in the mud that they do not realise that their resistance to change is not only contributing to the demise of their health, but also to the eradication of printmaking from their curriculum, and more importantly, from the arts. These toxic printmakers live in an environment of abject denial and ignorance which is academically not only unprofessional, but downright irresponsible.'

Dozens of art schools, art academies and printmaking studios visited by me during the past several years and recently, still use nitric acid to etch plates, use solvent based screen-printing inks and toxic solvents to clean up and use many of the one hundred or so other toxic materials used in traditional printmaking. One academy in central Europe did not even want to let me into their screen-printmaking studio last year - they knew of my background and reason for visiting. Good sense prevailed, my wife, Isa, and I got in. I informed those present that in my opinion, all were unknowingly committing collective suicide, by working in a studio lacking air extraction, no cross ventilation all the while using solvent based screen printing inks, mineral turpentine and nitro thinners. After an hour in that studio we left feeling light-headed; like being a little drunk from the toxic effects.

In the early 90s many researchers tried to formulate starch-based screen printing inks. Some used cooked corn starch and liquid universal pigments. These formulations did not keep in a wet state. Researchers tried using wall-paper glue - but this was too easily invaded by bacteria and decomposed over time at room temperature. Other problems surfaced - 'bubbles' appeared on the printed surface with a resultant 'orange peel' effect, paper buckled and retarders, when used, failed to slow down the drying process.

About this time plastisol screen-printing inks became increasingly popular and much of the research into starch-based printing ink was side-lined. My experience with these plastic emulsion printing inks, when used by students in particular, is that they print fine detail poorly and drying-in was a problem for slow working students. Still, art schools and printmaking studios demanded a ready-made printing ink and the acrylic product fitted the bill, despite being pretty expensive. Few are aware that these plastisol screen-printing inks are in fact liquefied PVC (polyvinyl chloride) - an environmentally damaging plastic. PVC is known to be ecologically problematic, so much so, that manufacturers data sheets indicate that it is essential to prevent seepage of their products into the sewage system and must not be allowed to reach ground water. Another warning reads that such printing inks must not be disposed of together with household rubbish.

Knowing then that starch based printing ink had to be better than solvent based and PVC formulated screen printing inks, I began my research.

My first water-based printing-inks were made from cooked bread flour and ground pigments; both unsophisticated and unsuccessful. My printing ink dried too quickly on the screen. Prints stuck to the underside of the screen The paper warped due to the effects of the water. Mould appeared in the printing ink after a day or so then lost viscosity, turning into a smelly, watery mess! All this gave me a clear indication of the challenges that lay ahead. My background in chemistry was going to be helpful. At some stage Nik Semenoff emailed me these prophetic words: 'It needed someone like you who was interested enough to take the effort and perfect an ink base that was a great improvement over simple pastes. I did not have the knowledge of organic chemistry to do it, you do'.

I believed I could formulate a starch-based, non-toxic and environmentally friendly screen printing transparent base with all the following properties:

- Easy to make and of correct consistency (viscosity).
- Slow drying on the screen, quick drying on the printed sheet.
- Would not cockle the paper after printing.
- Extended shelf life preferably without refrigeration.
- Easy to print and clean up.
- Possibility of achieving both transparent wash-like and opaque effects.
- Inexpensive.
- Permanent and waterproof.
- Ecologically safe.

It took years. Helped by Isa, the research involved much trial and error, meetings with mass food production chemists, doctors, toxicologists and paint manufacturing company researchers and a share of good luck. This eventually enabled us to invent a transparent base and printing ink with nearly all the properties we required: a thick, cream-like textured paste with the pleasant smell of honey. If and when required, finished prints are over-printed with a layer of transparent varnish through an open screen. Hopefully this will be improved upon, that the varnish will become an integral part of the printing paste. Research into this is on-going.

There is a very specific methodology involved in this technology - from the construction of and use of home-made vacuum-printing units, screens and equipment, the need to use suitable nylon and squeegees to the actual printing technique.

We own a large camper (RV) in Britain in which we keep all the equipment and materials required to print and can do so even inside the camper! We spend many months in Europe every year and invite you to contact us should you wish we pay you a visit. We are also in the States and Canada from time to time and have just returned from nine weeks in Australia and New Zealand - missing the earthquake in Christchurch by a week and the flooded Great Ocean Road beyond Melbourne by a single day!

We have also been helped enormously by feedback we have received from printmakers and students at the workshops and demonstrations we have conducted. In the interests of safety and health and in an effort to make a contribution, however small, to a better environment, let us continue sharing information and working together.

Maurice Kahn

Jerusalem.

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'SAFE' WATER-BASED SERIGRAPHY

using 'Maurisa' starch-formulated
transparent base and printing inks

'Maurisa' starch-based serigraphic transparent base is a combination of 'safe', environmentally friendly and non-toxic starches, bonding, retarding and deodorant agents. An added 'cocktail' of food preservatives ensures long shelf life. To this transparent base, appropriate quantities of universal pigments are added in order to achieve the degrees of transparency/opacity that the artist desires.

It takes about 45 minutes to make (cook) a batch of trasparent base. Following the cooking process, the transparent base must stand until it is cold, ideally overnight. While the transparent base may be refrigerated, this is not essential.

For use by students, I generally prepare a quantity of transparent base in advance. Students have then only to add a small quantity of retarder, water if thinning is required and pigment. The consistency has to be thick and creamy.

PREPARATION

Put 9 cups of cold water and 2 cups of 5% white vinegar into a heavy cooking pot.

Add 2.5 cups of white bread flour.

Mix well. Bring to the boil stirring continuously until the mixture thickens. For best results, use a blitzer type food mixer rather than stirring.

Mix half a cup of corn-flour and one cup of cold water in a separate container. Add this to the thick, hot mixture and continue cooking until the paste thickens even more. Add 1/4 cup of white sugar, 1 tablespoonful of honey and 2 tablespoonfuls of pectin and continue cooking. *The sugar is the bonding agent, the pectin helps form the thick, viscous, aqueous* *solution required upon cooling and also has a preservative property. The honey is a deodorant and also serves to prevent he growth of many bacteria.*

Mix in the preservative mixture (see below), cook for another minute then remove from the heat.

While still very hot, pour into sterile containers with lids excluding all air from the filled container. Snap on the lid and tape it closed or use as soon as it is cold. Empty tennis ball cans with snap on lids are ideal.

RETARDER

Propylene glycol C3H402 (E1520). (Besider its function as a retarder - flow and release agent - it also becomes a bonding agent. It has antiseptic qualities which prevent the growth of microorganisms).

PIGMENTS

All universal pigments are ideal colorants.

Toxicity issues in pigments

Susan Rostow's nontoxic pigment formulations

CHEMISTRY

Starches have a smaller molecule than solvent and plastic emulsion based printing ink components and so can pass through fine screens for better detail.

PRESERVATIVES & THE PRESERVATIVE "COCKTAIL"

Note that the 5% white vinegar acts as a preservative. It kills germs, viruses and acts to prevent mould. Note also that the honey and pectin have preservative qualities.

"COCKTAIL"

150 gm sodium chloride NaCl ***(preservative with hygroscopic qualities).***

50 gm lemon salt

20 gm sodium benzoate NaC6H5CO2 (E211) ***(prevents the formation of mould and increases shelf life).***

30 gm potassium sorbate C6H7KO2 (E202) (*inhibits mould and increases shelf life*).

30 gm sodium nitrate NaNO3 (*food preservative - has anti-microbial properties*).

20 gm potassium nitrate KNO3 (food preservative).

50 gm aluminium sulphate Al(SO4)3 16 H20 ***(purifies water and acts as a preservative due to its remarkable resistance to oxidation. It is also a deodorizer, a firming agent and controls the PH).***

Maurisa Silkscreen Medium: Testing the finished product,

Maurice Kahn and Wim Legrand, studio manager of the Frans Masereel Printmaking Center in Kasterlee, Belgium

Important is the heavy pot used to cook the paste - the paste can be easily burnt therefore the heavy pot is critical.
The food blitzer is the best utensil to make the paste.
It is used almost continuously during the preparation.
Note the consistency of the paste - it smells of honey and is quite pleasant.
When demonstrating, I usually offer participants the chance to taste at this stage. Generally there are no "takers" so I eat a teaspoonful of the stuff - it actually tastes awful - largely because of the lemon salt.
Due to the large number of food preservatives in the printing paste, I would not recommend eating this on a regular basis and certainly not after the addition of pigment!
Bon appetite!

Maurice Kahn - Short Biography

Maurice Kahn, South African and Israeli printmaker and art educator, graduated from the Fine Art Department of the University of the Witwatersrand and the College of Higher Education in Johannesburg. He began his teaching career at the Johannesburg College of Art, the University of Natal and was Head of the Department of Fine Arts at the Durban-Westville University. His printmaking studios in Johannesburg and Durban became the focal point for leading artists in South Africa, among them Cecil Skotnes, Cecily Sash and Andrew Verster.
In the mid seventies he left South Africa for Israel from which time he has been a senior lecturer, teaching printmaking at the Bezalel Academy of Arts and Design in Jerusalem.
Maurice's increasing awareness of the health risks involved in using toxic materials prompted his research into ways of reducing such dangers. Following years of "trial and error", he eventually formulated a workable serigraphic technology and methodology, solving the problems related to starch decomposition and decay. By so doing, he succeeded in eliminated the use of both oil- based as well as environmentally damaging Plastisol (water-based PVC) screen-printing inks from his own studio and from the studios at the Bezalel Academy.
Maurice Kahn's research is ongoing. He values and relies on objective feed-back from faculty, artists and students wherever he goes, hoping for a combined, continuing effort to make our studios safer places in which to create and study.

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