ICDLI

International Committee of the Decorative Laminates Industry

# Information Data Sheet 2

**Chemical Resistance of**
**Decorative High Pressure Laminates (HPL)**

December 2007

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## 1. General

In these recommendations emphasis is placed on presenting the chemical resistance of decorative high-pressure laminates (HPL conforming to EN 438) and the application possibilities arising from it. Due to its melamine resin surface decorative laminates offers especially effective resistance to most chemicals and has excellent mechanical characteristics and high temperature resistance. HPL can therefore be used in situations where its surface will be exposed to the following:

- Chemicals used in laboratories and in manufacturing
- Solvents
- Disinfectants
- Dyes
- Bleaching agents
- Cosmetics
- Medicines

The ability of HPL to withstand the action of individual chemicals is shown in Section 4. Careful note should be taken of all the relevant recommendations and notes contained in this manual.

## 2. Application areas of high-pressure decorative laminates

HPL is available in almost unlimited variety of decors and colours. Moreover, the material permits the creation of numerous shapes (e.g. by subsequent forming or in the form of high pressure compact boards) and also offers the possibility of covering large areas without gaps. This, as well as its outstanding mechanical properties like the high wear resistance, makes HPL suitable for installations in the following critical areas:

Dispensing chemists, Medical centres, hospitals, veterinary practices

Laboratories:
- Chemistry labs
- Photographic labs
- Biological / medical labs

Shop fitting:
- Hairdressers
- Butchers
- Food stores

Meat-processing industry:
- Meat and sausage factories
- Abattoirs

General rules applying to all these applications are as follows:

### 2.1 Vertical surfaces

For use on vertical surfaces such as doors, furnishings or wall claddings, HPL panels can generally be used without restrictions. The recommendations below therefore apply predominantly to HPL work surfaces.

### 2.2 Horizontal surfaces

When selecting a surface texture for HPL panels for use on horizontal surfaces, the type of stresses to which it will be exposed should be taken into account.

### 2.3 Special properties

HPL is resistant to most chemicals (see Section 4.1.) Some chemicals however may attack the surface. Critical in that respect are:

- the concentration of the chemical
- the pH – value (the acid / alkaline balance)
- the exposure time
- the temperature

It is therefore recommended to remove as quickly as possible chemicals listed under section 4.2. whereas chemicals of section 4.3. must be removed immediately.

HPL panels offer considerably better resistance to heat than most thermoplastics (e.g. PVC, PE, PS, ABS). HPL can withstand temperatures of at least 180 °C (conforming to EN 438 Part 2, § 8). Extreme heat, e.g. from Bunsen burners or sources of infrared rays can result in discolouration or destruction through carbonisation. In such situations the HPL surfaces should be protected by heat-resistant (e.g. ceramic) surfaces.

### 2.4 Cleaning and maintenance

HPL is easy to clean and resistant to organic solvents. For stains or marks that cannot be removed using cold or hot water in combination with a common detergent, organic solvents can be used. Frequent cleaning with harsh abrasives can result in damage to the melamine surface, with the result that resistance to the action of chemicals is reduced. Such abrasive cleaning agents should only be used with caution.

## 3. Special characteristics of HPL in the various application fields

### 3.1 Dispensing chemists, pharmacies and drugstores

The following products do not pose any problem to HPL:
- Foodstuffs and juices
- Solvents and detergents
- Cosmetics and cosmetic cleaning agents (e.g. nail varnish remover)
- Medicines

Chemicals and cleaning agents, varnishes and paints should be generally transferred to the laboratories in closed containers, then placed and dispensed in special areas. Since the nature and composition of such chemicals are not always known, it is advisable to remove any spillage immediately. Dried varnishes and paints can be removed easily using solvents, e.g. alcohol, acetone, providing they have not hardened.

### 3.2 Medical centre, treatment rooms, operating theatres

HPL is a useful material in such areas, as it offers excellent cleaning properties and is easy to disinfect. It can withstand disinfectants based on:

| | |
|---|---|
| Alcohols | e.g.: Ethanol 70% |
| Aldehydes | e.g.: Formalin 1% and 5% |
| Phenols | e.g.: p-chloro-m-kresol 0.3% |
| Quaternary Ammonium Compounds | |

HPL can cover large areas without any joints or gaps. Blood, urine, faeces and ointments etc. will not affect the surface and can be removed very easily. HPL is transparent to X-rays and is therefore very suitable for examination tables. HPL is not damaged when exposed to UV, IR and laser rays emitted by medical equipment.

### 3.3 Medical and biology labs

HPL is comparatively well suited for use in these types of laboratories (easy to clean and to disinfect). Nevertheless, substances containing strong dyes (e.g. liquids used for colouring specimens prior to viewing with a microscope) and substances with strong oxidising properties (e.g. hydrogen peroxide) can leave marks if such solutions are left on the surface for any more than a short time. Such substances should therefore be removed immediately.

### 3.4 Equipment in hairdressing salons

The majority of products used in hairdressing salons do not affect HPL. Dried deposits of nail varnish, hairsprays or beauty products (lipstick, pomade) can be removed easily using organic solvents like alcohol or acetone. Spots, stains or marks caused by hair dyes and bleaching agents should be removed as soon as possible in order to avoid discolouration of the surface.

### 3.5 Photographic laboratories

The chemicals generally used for developing film and in fixative baths will not damage the HPL surface, but solutions containing dyes and “silver salts” can cause discolouration. It is therefore of particular importance to remove such spillages as soon as possible.

### 3.6 Physical or technical laboratories

In general, HPL can be used for work surfaces without any restrictions. As in physical or technical laboratories surfaces may be subjected to a higher mechanical stress, it is advisable to install surfaces with a rougher surface texture.

**Battery acid - Warning!:** Any drops should be removed immediately as otherwise they will leave marks or permanent stains on the surface.

### 3.7 Chemical laboratories

Chemical laboratories usually work with aggressive substances but HPL has the advantage of being resistant to most of them (see section 4.1.) Some chemicals, however, depending on their type, pH value and concentration, can damage the laminates surface if allowed to react for a prolonged time (examples: see section 4.2.). Residues of such substances should therefore be removed immediately.

The chemicals listed under section 4.3. attack most materials and can also cause irreversible changes to the decorative surface of HPL. When using such substances, HPL surfaces should be protected, e.g. by using a suitable covering.

HPL is in principle also suitable but not recommended for the inside walls of fume cupboards. After prolonged action of aggressive vapors however such as sulphur dioxide, chlorine, bromine, acid fumes, etc, the appearance of the HPL surface will deteriorate, but its functionality is not affected.

### 3.8 Foodstuffs industry, food stores

Its cleanability and resistant to disinfectants make HPL panels especially well-suited for these fields. There is no migration affecting foodstuffs and, consequently, HPL is approved for contact with foodstuffs.

### 3.9 Meat and fish processing

Due to its hygienic properties and easy cleaning, HPL has proved to be a versatile material for walls, doors, working surfaces etc. in abattoirs, butchers and meat or fish processing plants. It is also resistant to blood and animal excrements. As cleaning is often carried out using high pressure water or steam equipment, boards, panels and fixing systems should be manufactured and installed in a way, that ingress of moisture to the core materials is prevented.

## 4. Chemical resistance of HPL

The list below does not claim to be complete, yet providing an overview of the resistance of HPL at room temperature against the most commonly used substances (in solid, solution, liquid or gaseous form). It is advisable to make inquiries about the resistance of HPL to any particular chemicals not included below.

### 4.1 Chemicals to which HPL has full resistance

HPL is resistant to the substances and reagents listed below. Even if the panels are exposed to them over a long period (this could be 16 hours as in EN 438, Part 2 § 15), these substances will not alter the surface of the panels.

| Substance | Chemical formula |
|---|---|
| A-naphthaline | $C_{10}H_7NH_2$ |
| A-naphthole | $C_{10}H_7OH$ |
| Acetic acid | $CH_3COOH$ |
| Acetic acid ethyl ester | $CH_3COOC_2H_5$ |
| Acetic acid iso-amyl ester | $CH_3COOC_5H_{11}$ |
| Acetone | $CH_3COCH_3$ |
| Alcoholic beverages | ROH |
| Alcohols ( any ) | ROH |
| Aldehydes | RCHO |
| Alum solution | $KAl(SO_4)_3$ |
| Aluminium sulphate | $Al_2(SO_4)_3$ |
| Amides | $RCONH_2$ |
| Amines ( any ) | |
| Ammonia | $NH_4OH$ |
| Ammonium chloride | $NH_4CL$ |
| Ammonium sulphate | $(NH_4)_2SO_4$ |
| Ammonium thiocyanate | $NH_4SCN$ |
| Amyl acetate | $CH_3COOC_5H_{11}$ |
| Amyl alcohol | $C_5H_5NH_2$ |
| Arabinose | $C_5H_{10}O_5$ |
| Ascorbic acid | $C_6H_8O_6$ |
| Asparagic acid | $C_4H_7O_4N$ |
| Aspargine | $C_4H_8O_3N_2$ |
| Barium chloride | $BaCl_2$ |
| Barium sulphate | $BaSO_4$ |
| Benzaldehyde | $C_6H_5CHO$ |
| Benzene | $C_6H_6$ |
| Benzidine | $NH_2C_6H_4C_6H_4NH_2$ |
| Benzonic acid | $C_6H_5COOH$ |
| Blood group test Sera | |
| Boric acid | $H_3BO_3$ |
| Butyl acetate | $CH_3COOC_4H_9$ |
| Butyl alcohol | $C_4H_9OH$ |
| Cadmium acetate | $Cd(CH_3COO)_2$ |
| Cadmium sulphate | $CdSO_4$ |
| Calcium Carbonate (chalk) | $CaCO_4$ |
| Calcium chloride | $CaCl_2$ |
| Calcium hydroxide | $Ca(OH)_2$ |
| Calcium oxide | CaO |
| Calcium nitrate | $Ca(NO_3)_2$ |
| Cane sugar | $C_{12}H_{22}H_{11}$ |
| Carbol-xylene | $C_6H_5OH\text{-}C_6H_4(CH_3)_2$ |
| Calbolic acid | $C_6H5OH$ |
| Carbon tetra chloride | $CCl_4$ |
| Caustic soda up to 10% | contains NaOH |
| Chloral hydrate | $CCl_3CH(OH)_2$ |
| Chlorobenzene | $CHCl_3$ |
| Cholesterol | $C_{27}H_{45}OH$ |
| Citric acid | $C_6H_8O_7$ |
| Cocaine | $C_{17}H_{21}O_4N$ |
| Cooking salt | NaCl |
| Copper sulphate | $CuSO_4$ |
| Cresol | $CH_3C_6H_4OH$ |

| | |
|---|---|
| Cresylic Acid | $CH_3C_6H_4COOH$ |
| Cyclo hexane | $C_6H_{11}OH$ |
| Digitionine | $C_{56}H_{92}O_{29}$ |
| Dimethyl fornamide | $HCON(CH_3)_2$ |
| Dioxane | $C_4H_8O_2$ |
| Dulcite | $C_6H_{14}O_6$ |
| Dimethyl sulphoxide | $(CH_3)_2SO$ |
| Ester ( any ) | RCOOR' |
| Ether ( any ) | ROR' |
| Ethyl acetate | $CH_3COOC_2H_5$ |
| Ethylene chloride | $CH_2{:}CCl_2$ |
| Formaldehyde | HCHO |
| Formic acid up to 10% | HCOOH |
| Glacial acetic acid | $CH_3COOH$ |
| Glucose | $C_6H_{12}O_6$ |
| Glycerine | $CH_2OH$ CHOH $CH_2OH$ |
| Glycocol | $NH_2CH_2COOH$ |
| Glycol ( any ) | $HOCH_2$ $CH_2OH$ |
| Graphite | C |
| Gypsum | $CaSO_4$ $2H_2O$ |
| Heptanol | $C_7H_{15}OH$ |
| Hexane | $C_6H_{14}$ |
| Hexanol | $C_6H_{13}OH$ |
| Hydrogen peroxide 3% | $H_2O_2$ |
| Hydroquinone | $HOC_6H_4OH$ |
| Inorganic salts and their mixtures (exception No 4.2.) | |
| Inosite | $C_6H_6(OH)$ |
| Iso-propanol | $C_3H_6OH$ |
| Ketone ( any ) | RCR |
| Lactic acid | $CH_3CHOHCOOH$ |
| Lactic sugar | $C_{12}H_{22}O_{11}$ |
| Lactose | $C_{12}H_{22}O_{11}$ |
| Lead acetate | $Pb(CH_3COO)_2$ |
| Lead nitrate | $Pb(NO_3)_2$ |
| Levulose | $C_6H_{12}O_6$ |
| Lithium Hydroxide | LiOH up to 10% |
| Lithium carbonate | $Li_2CO_3$ |
| Magnesium carbonate | $MgCO_3$ |
| Magesium chloride | $MgCl_2$ |
| Magnesium hydroxide | $Mg(OH)_2$ |
| Magnesium sulphate | $MgSO_4$ |
| Maltose | $C_{12}H_{22}O_{11}$ |
| Mannite | $C_6H_{14}O_6$ |
| Mannose | $C_6H_{12}O_6$ |
| Methylene chloride | $CH_2CL_2$ |
| Mercury | Hg |
| Mesoinosite | $C_6H_6(OH)_6$ |
| Methanol | $CH_3OH$ |
| Mixtures (exception: No 4.2.) | |
| Nickel sulphate | $NiSO_4$ |
| Nicotine | $C_{10}H_{14}N_2$ |
| Octanol (Octylacohol) | $C_6H_{17}OH$ |
| Oleic acid | $CH3(CH_2)_7CH{:}CH(CH_2)_7COOH$ |
| P-amino aceto-phenone | $NH_2$ $C_6H_4COOCH_3$ |
| P-nitro phenol | $C_6H_4NO_2OH$ |
| Paraffin | $C_NH_{2n+2}$ |
| Pentanol | $C_5H_{11}CH$ |
| Percaulic acid | $HCLO_4$ |
| Phenolphthaleine | $C_{20}H_{14}O_4$ |
| Phenol & phenolic derivates | $C_6H_5OH$ |
| Potassium aluminium sulphate | $KAI(SO_4)_2$ |
| Potassium bromate | KBr |
| Potassium bromide | $KBrO_3$ |
| Potassium carbonate | $K_2CO_3$ |
| Potassium chloide | KCl |
| Potassium hexa cyano ferrate | $K_4[Fe(CN)_6]$ |
| Potassium hydroxide up to 10% | KOH |
| Potassium iodate | $KIO_3$ |
| Potassium nitrate | $KNO_3$ |
| Potassium sodium tartrate | $KNaC_4H_4O_6$ |
| Potassiom sulphate | $K_2SO_4$ |
| Potassium tartrate | $K_2C_4H_4O_6$ |
| Propanol | $C_3H_7OH$ |
| 2.1.-propylene glycol | $CH_3CHOH_2OH$ |
| Pyridine | $C_5H_5N$ |
| Rafinose | $C_{18}H_{32}O_{15}$ $5H_20$ |
| Rhamnose | $C_6H_{12}O_5$ $H_20$ |
| Salicyclic acid | $C_6H_4OHCOOH$ |
| Salicylic aldehyde | $C_6H_4OH$ CHO |
| Sodium acetate | $CH_3COONa$ |
| Sodium b-sulphate | $NaHSO_3$ |
| Sodium carbonate | $Na_2CO_3$ |
| Sodium chloride | NaCl |
| Sodium citrate | $Na_3C_6H_5O_7$ $5H_20$ |
| Sodium di-ethyl-barbitirate | $NaC_8H_{11}N_2O_3$ |
| Sodium hydrogen carbonate | $NaHCO_3$ |
| Sodium hypo-sulphite | $Na_2S_2O_4$ |
| Sodium nitrate | $NaNO_3$ |
| Sodium phosphate | $Na_3PO_4$ |
| Sodium silicate | $Na_2SAiO_3$ |
| Sodium sulphate | $Na_2SO_4$ |
| Sodium sulphide | $Na_2S$ |
| Sodium sulphite | $Na_2SO_3$ |
| Sodium tartrate | $Na_2C_4H_4O_6$ |
| Sodium Thio Sulphate | $Na_2S_2O_3$ |
| Sorbite | $C_6H_{14}O_6$ |
| Stearic acid | $C_{17}H_{35}COOH$ |
| Styrene | $C_6H_5$ $CH{:}CH_2$ |
| Sugar and sugar derivatives | $H_{22}O_{11}$ |
| Sulphur | S |
| Talcum | $3Mg0,4SiO_2$, $H_2O$ |
| Tannin | $C_{76}H_{52}O_{46}$ |
| Tartaric acid | $C_4H_8O_6$ |
| Tetra hydro furan | $C_4H_8O$ |
| Tetraline | $C_{10}H_{12}$ |
| Thio-urea | $NH_2CSNH_2$ |
| Thymol | $C_{10}H_{14}O$ |
| Toluene | $C_6H_5CH_3$ |
| Trehalose | $C_{12}H_{22}O_{11}$ |
| Trichorethylene | $CHC1{:}COl_2$ |
| Tryptophane | $C_{11}H_{12}O_2N_2$ |
| Uric acid | $C_5H_4N_4O_3$ |
| Uric acid solution | $CO(NH_2)_2$ |
| Vanilline | $C_8H_8O_3$ |
| Xylene | $C_6H_4(CH)_2$ |
| Zinc chloride | $ZnCl_2$ |
| Zinc sulphate | $ZnSO_4$ |

**4.2. Chemicals to which HPL has limited resistance**

Surfaces of HPL are not altered, if the substances quoted below (especially in liquid or dissolved form) are only in contact for a short time, 10-15 minutes. The boards must be wiped with a wet cloth and subsequently dried.

| Substance | Chemical formula |
|---|---|
| Aluminium chloride | $AlCl_3$ |
| Amido-sulphonic acid | $NH_2SO_3H$ |
| up to 10% | $NH_2SO_3H$ |
| Ammonium hydrogen | |
| Sulphate | $NH_4$ $HSO_4$ |
| Arsenic acid up to 10% | $H_3AsO_4$ |
| Caustic soda in concentration | $NaOH$ > 10% |
| Crystal violet (gentian violet) | $C_{24}H_{26}N_3Cl$ |
| Ferric chloride | $FeCl_3$ |
| Ferrous chloride | $FeCl_2$ |
| Fuchsine | $C_{19}H_{19}N_3O$ |
| Hydrochloric acid up to 10% | $HCl$ |
| Hydrogen peroxide 3-30% | $H_2O_2$ |
| Inorganic acids up to 10% | |
| Iodine | $I_2$ |
| Lithium hydroxide over 10% | $LiOH$ |
| Mercuric chloride solution | $HgCl_2$ |
| Mercuric di-chromate | $HgCr_2O_7$ |
| Methylene blue | $C_{16}H_{16}N_3ClS$ |
| Million reagent | $OHg_2NH_2Cl$ |
| Nitric acid up to 10% | $HNO_3$ |
| Oxalic acid | COOH COOH |
| Phosphoric acid up to 10% | $H_3PO_4$ |
| Picric acid | $C_6H_2OH(NO_2)_3$ |
| Potassium chromate | $K_2CrO_4$ |
| Potassium di-chromate | $K_2Cr_2O_7$ |
| Potassium hydrogen | |
| Sulphate | $KHSO_4$ |
| Potassium hydroxide in | $KOH$ > 10% |
| Potassium iodine | $KI$ |
| Potassium permanganate | $KMnO_4$ |
| Silver nitrate | $AgNO_3$ |
| Sodium hydrogen sulphate | $NaHSO_4$ |
| Sodium hypo-chlorite | $NaOCl$ |
| Sulphuric acid up to 10% | $H_2SO_4$ |

**4.3. Chemicals to which HPL has no resistance**

The following substances must be removed immediately since they can irreparably damage the HPL surface after a very short contact time

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| Substance | Chemical formula |
|---|---|
| Adhesives (chemically hardened) | |
| Amido sulphonic acid* | $NH_2SO_3H$ |
| Inorganic acids* eg | |
| Aqua regia* | $HNO_3 + HCl = 1:3$ |
| Arsenic acid | $H_3AsO_4$ |
| Chrome – sulphuric acid* | $K_2Cr_2O_7 + H_2SO_4$ |
| Formic acid* | HCOOH |
| Hydrochloric acid* | $HCl$ |
| Hydrofluoric acid* | $HF$ |
| Hydrogen bromide* | $HBr$ |
| Nitric acid* | $HNO_3$ |
| Phosphoric acid* | $H_3PO_4$ |
| Sulphuric acid* | $H_2SO_4$ |

* In concentration over 10%

**4.4. Aggressive gases**

Repeated or prolonged interaction with the following aggressive gases and vapours leads to a deterioration of the HPL surface.

| Substance | Chemical formula |
|---|---|
| Acid Fumes | |
| Bromine | $Br_2$ |
| Chlorine | $Cl_2$ |
| Nitrous fumes | $NO_x$ / $N_xO_y$ |
| Sulphur dioxide | $SO_2$ |

**International Committee of the Decorative Laminates Industry (ICDLI)**

For more than 40 years the ICDLI is the international representation of the interests of the European laminates manufacturers. Further information about the ICDLI and the data sheets published up to now you will find under
This application was compiled by the International Committee of the Decorative Laminates Industry.
It considers the conditions of application technology in the European countries.

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If you have further questions, please contact us:

International Committee of the Decorative Laminates Industry (ICDLI)
Am Hauptbahnhof 12, 60329 Frankfurt am Main,
Phone +49 69 2 71 05-29, Fax +49 69 23 98 37,
E-Mail : ubonn@gkv.de

Status: December 2007