

Dycem Purity Documentation

Introduction

The data in the following table is a summary of tests undertaken on Dycem products over the last nine years as part of the company's continued programme of research and development. The test data, designed to substantiate the properties of Dycem products for use in critical environments, is divided into two distinct areas of investigation:

- 1. Outgassing Behaviour – Organic Components:** A series of tests directed to establish whether organic components used in the manufacture of Dycem products are released into the atmosphere under conditions and in environments where the product will be used.
- 2. Composition and Physical Transfer – Inorganic Components:** A series of tests directed to establish the presence of inorganic components, existing mainly as metal ions, in Dycem products and electronic components such as wafers or disks.

Results

Outgassing

In common with many other products based wholly or in part on organic polymeric compositions, Dycem products release minute quantities of organic components when exposed for prolonged periods to elevated temperatures. At 50°C, tests over a period of more than eight hours show release of quantities less than 0.1 microgram per gram of product for Dycem products in the form of Clean-Zone flooring and rollers. A typical peel-off mat shows a slightly higher level of emission.

At 125°C to test methods such as ASTM E-595 and European Space Agency Specifications, levels of emission are observed which exceed those specified for materials to be used in space (Total Material Lost <1%). When tested at 50°C by ASTM E-595, however, Dycem Clean-Zone meets this criterion.

At ambient temperatures, sensitive measurements by head-space gas chromatograph and mass spectroscopy techniques (HS/GC/MS) used in the Swedish Flooring Association FLEC tests show no detectable levels of emission for Dycem Clean-Zone.

Similar performance is observed for commercial grades of flooring widely specified for use within cleanroom environments and typical peel-off mats show the same behaviour.

It is likely that (HS/GC/MS) techniques will be a principal feature of draft standards on outgassing to be published by the Institute of Environmental Sciences in 1998.

Under normal conditions of usage, therefore, a range of results supports the conclusion that Dycem Clean-Zone represents no outgassing hazard in cleanroom environments at ambient temperatures.

Composition and Physical Transfer

Measurement by neutron bombardment in the NAA (Neutron Activation Analysis) test method, a sensitive procedure for bulk material analysis, establishes relatively high levels of Sodium, Potassium and Barium in Dycem products together with somewhat lower levels of Titanium, Zinc and Iron.

These elements are bound within the organic matrix and will not become separated from the mass of material so as to enter the environment in which the product is used. It has been demonstrated, however, by surface measurement technology (TXRF analysis), that some transfer can occur over time to other surfaces with which the product may be in direct continuous contact.

Dycem products are not recommended, therefore for applications where the material may remain in sustained direct contact with surfaces sensitive to electronic contamination, such as a silicon wafer or a disk.

Tests

Outgassing

Surface Science Laboratories CA, USA

Report No: 5030 – 0593

Date: June 24 1993

Method: Analysis by Fourier Transform Infrared (FTIR) Spectroscopy using reflectance microscopy

NASA (Materials Science Laboratory)

Report No: MTB – 711 – 87

Date: June 20 1988

Method: Measurement of Total Material Loss
ASTM G595

MTS Pendar (UK)

Report No: 46798
 Date: September 2 1991
 Method: Conducted using the European Space Agency
 Specifications P55-01-702
 Test temperature 125°C
 Collector temperature 25°C

Concentration

Genetic GmbH München, Germany

Report No: 10047
 Date: July 22 1996
 Method: NAA

Transfer Test

Genetic GmbH München, Germany

Report No: 10047
 Date: July 22 1996
 Method: TXRF

Purity Tests

Dycem has been independently tested (EVC Test Method) at the practical working temperature (ambient) and no emissions were detected.

To the best of our knowledge, this information is correct at printing.

Purity study of Dycem vs. Peel-off mat

Element	Dycem			Peel-off mat		
	Concentration	Outgassing		Transfer test	Outgassing	
		RT*	Ug/gram*	Conc (at/cm ²)	RT*	Ug/gram*
Aliphatic Alcohol	-				6.2	0.04
Aliphatic Hydrocarbon	-				2.80 7.00	0.04 0.04
Carbon Disulfides	-				1.47	0.04
Chlorinated solvent	-	2.32	0.1			
Antimony (Sb)	2.93					

Arsenic (As)	-					
Barium (Ba)	500			2.3E + 13		
Bromine (Br)	12.9					
Cadmium (Cd)	1.20					
Caesium (Cs)	0.089					
Calcium (Ca)	-					
Cerium (Ce)	0.65					
Chromium (Cr)	0.51					
Chlorine (Cl)	-			5.8E + 13		
Cobalt (Co)	0.76					
Copper (Cu)	-			3.9E + 11		
Europium (Eu)	0.016					
Gadolinium (Gd)	-					
Gallium (Ga)	0.41					
Gold (Au)	0.001 1					
Hafnium (Hf)	0.043					
Holmium (Ho)	-					
Indium (In)	-					
Iridium (Ir)	-					
Iron (Fe)	60.2			2.0E + 12		
Lanthanum (La)	0.28					
Lutetium (Lu)	-					
Mercury (Hg)	-					

Molybdenum (Mo)	-					
Neodymium (Nd)	-					
Nickel (Ni)	-					
Osmium (Os)	-					
Palladium (Pd)	-					
Platinum (Pt)	-					
Potassium (K)	630			6.0E + 13		
Praseodymium (Pr)	-					
Rhenium (Re)	-					
Rubidium (Rb)	1.55					
Ruthenium (Ru)	-					
Samarium (Sm)	0.11					
Scandium (Sc)	0.049					
Selenium (Se)	-					
Silver (Ag)	-					
Sodium (Na)	1904					
Strontium (Sr)	-					
Sulphur (S)	-			1.6R + 14		
Tantalum (Ta)	-					
Terbium (Tb)	0.030					
Thorium (Th)	0.17					
Tin (Sn)	-					
Titanium (Ti)	305					

Tungsten (W)	0.17					
Tellurium (Te)	-					
Uranium (U)	0.15					
Yterbium (Yg)	0.034					
Yttrium (Y)	-					
Zirconium (Zr)	-					

Outgassing:

RT = Retention time in minutes

Ug/gram = Estimate of outgassed amount in micrograms/grams

Sample based on response to heptane

DYCEM AND THE ENVIRONMENT

Dycem Products only need to be cleaned, so no waste is generated, unlike peel off mats where an 8" ball of consumable waste is generated from peeled sheets.

Can Dycem be recycled ? Yes, because Dycem has a thermoplastic base, Dycem Products can be shredded, re-melted and recycled into products with a similar polymeric base and compatible formulations. Protectamats can be recycled into products which use recycled polymer such as garden hoses and moulded footwear. Clean Zone and Work Zone can be recycled into flooring and carpet tiles.

Dycem Products are not environmentally hazardous. They can be safely disposed of by normal methods of disposal for industrial and household waste such as incinerators or land-fill.

Dycem products do not create static charges, unlike Peel Off mats which can generate up to 5,000 volts with each sheet peeled.

The data presented and the conclusions expressed in this publication are presented in good faith and are believed to be correct at the time of publication.