

Typical faults detected by Liquid Crystal analysis

- Gate Oxide Breakdown
- Floating gates
- Missing polysilicon
- Silicon Oxide pinholes
- Intermittent shorts
- Leakage under Aluminum

Typical Materials in Liquid Crystal Kits

- Liquid crystals with range of clearing points
- Polarizing filters fit to the microscope (located at light input port and microscope head/eyepieces)
- Artist Brushes

*** Available at laboratory supply houses**

- * Container to protect the liquid crystals from UV light
- * Color/UV filter(s); typical - Yellow filter
- * Syringe for measuring and transferring solvents-25ml
- * Ultraviolet light shield
- * Capillary tubes and rubber bulbs
- * Droppers
- * Small mixing vials
- * Measuring rack to hold vials
- * Glass bottle(s) for solvent
- * Waste bottle(s)
- * Cleaning Tissues
- * Labels
- * Filter paper to help in LC solids transfer

Introduction

This Data Sheet provides information on the types of liquid crystal materials and supporting materials needed to assemble a test kit. Liquid crystals are used in testing semiconductors to locate defects which generate heat and in analyzing power distribution in semiconductor devices. Liquid Crystals are used in conjunction with precise control thermal chucks and socket stages.

Liquid Crystal Test General Procedure

A thin film of liquid crystals (LC) is spread evenly across a semiconductor (wafer or decapsulated packaged chip) part. The test sample is heated until its surface reaches the “transition or clearing” temperature of the liquid crystal used. At this temperature the device is dark as viewed with the aid of polarizing filters in the microscope. The temperature of the test sample is then lowered until the device appears bright. The test sample circuitry is then powered. A dark spot will appear where the powered device has a hot spot (defect). Often the defect area can be more precisely located by reducing the test sample’s temperature by a few tenths of a degree Celsius. Switching the power on and off, or adjusting the frequencies to a rate more easily seen by the eye may also be used to identify defect locations.

Good adhesion and deposition of a thin even coat of the LC material to the device under test is very important to successful use of the LC. The surface of the sample of oils and other contaminants is typically cleaned in order to provide uniform adhesion; some typical cleaning solvents are acetone, a 1:1 mixture of acetone and methyl chloroform or Safezone™ Precision Cleaning Solvent. Many liquid crystal materials need to be diluted in a solvent in order to be applied in a thin uniform layer; this is typically done with the solvents listed below. Whether the liquid crystal is used in concentrated or dilute form is best determined by the end user in consultation with the liquid crystal supplier.



1555 Forrest Way
Carson City, NV 89706
info@micromanipulator.com
www.micromanipulator.com

Tel: 775-882-2400
Tel: 800-654-5659
Fax: 775-882-7694
Made in the USA

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Specifications subject to change without notice.

Liquid Crystal Materials

Traditional liquid crystal clearing temperature formulations: 42.9, 47.5, 53.3, 76.0 °C
Liquid crystals with a clearing temperature of 42.9 or 47.5 are typically used for identifying low power devices. Higher clearing temperature liquid crystals are used for high power devices. Extended color range mixtures are used for thermal mapping.

Clearing Temp	Part Number	Source
42.9°C	ME105	Hallcrest
53.3°C	BN/R40C1W/TM3A mixture	Hallcrest
47.5°C	101246 (RO-001510 or ME6N)	EMD
76.0°C	010105 (NP4)	EMD

Liquid Crystal Suppliers

All suppliers listed here have stated that they formulate liquid crystals with specific clearing temperatures to the user requirements.

Hallcrest, Inc. for US Sales

1820 Pickwick Lane
Glenview, IL 60025
Tel: 847-998-8580
Fax: 847-998-6866
E-mail: hcsales@hallcrest.com

EMD Chemicals Inc.

7 Skyline Drive
Hawthorne, NY 10532
Phone: 914-592-4660
Fax: 914-592-9469
Email:
eminfo@emdchemicals.com

Accelerated Analysis

PMB Q-310
80 N. Cambrillo Hwy.
Half Moon Bay, CA 94019
Tel: 650-867-8443
Fax: 650-726-1833
Email: davidburgess@
acceleratedanalysis.com;
Model LCxxR Liquid Crystal.

Solvents Source: Safezone™ www.miller-stephenson.com

Typical solvents used to dilute and clean off liquid crystals are acetone or Safezone™ Precision Cleaning Solvent. Safezone™ is a mixture of 1,1-dichloro-1-fluoroethane 96% and Methanol 3.9%. Safezone™ Precision Cleaning Solvent MS-941/CO₂ (aerosol spray) or MS-943 (liquid).

Polarizing and Color/UV Filters Source: Micromanipulator

US-POL-KIT: Polarizer kit BD 100 microscopes
POL-KIT-FS70: Polarizing accessory, FS-70
POL-KIT-FS70-2: Polarizing accessory, FS-70 for use with two wavelength lasers (266 and 532 nm)
POL-KIT-FS70-3: Polarizing accessory, FS-70 for use with three wavelength lasers (266, 532 and 1064 nm)

Potential source: microscope supplier, or optical parts supply houses.

Micro-capillary Pipettes disposable Source: Micromanipulator

- MPTCAP-100: 100 µl capacity, one bulb and 100 tubes set
- MPTCAP-200: 200 µl capacity, one bulb and 100 tubes set

Potential source (distributor): Cole-Parmer

www.coleparmer.com

Laboratory Supplies Source: ChemIndustry.com

Color/UV Filters	Measuring rack to hold vials	Container
Cleaning Tissues	Glass bottles for solvents	Labels
Waste Bottles	Small mixing vials	Droppers
Filter Paper to help in LC solids transfer		