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Electrochemical migration in printed wiring boards and assemblies — Mechanisms and testing

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colour inside

Electrochemical migration in printed wiring boards and assemblies – Mechanisms and testing

Migration électrochimique dans les cartes a circuits imprimés et assemblages – Mécanismes et essais

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTROCHEMICAL MIGRATION IN PRINTED WIRING BOARDS AND ASSEMBLIES – MECHANISMS AND TESTING

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IEC/TR 62866, which is a technical report, has been prepared by IEC technical committee 91: Electronics assembly technology.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
91/1102/DTR	91/1128/RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

Electronic products including components nowadays are designed to satisfy the demands for miniaturization, high functionality and environmentally friendly products. Various types of degradation occur in the electronic products used in the field. Appropriate measures are required to mitigate such degradation from the standpoint of reliability assurance. A study has been carried out to develop the understanding of the phenomenon and has proposed test methods for electrochemical migration with the purpose of suppressing the migration in products used in the field.

This Technical Report is related to electrochemical migration including conductive anodic filament (CAF). Specifically, it explains:

- the preliminary test: the steady state temperature humidity test, the temperature humidity cycle test, the unsaturated pressurized vapor test, the saturated pressurized vapor pressure test, the dew condensation cycle test and the water drop test;
- the insulation resistance measurement method: manual measurement, automatic measurement, a dielectric characteristics method, and an AC impedance method. Moreover, the difference between the measurement while the specimen is kept in the testing environment and not taken out of the chamber for measurement, and the measurement of the resistance of a specimen while it is taken out of the test chamber, and the merit of an automatic measurement are also described;
- the equipment used for analysis, the observation method of a failure part, and examples which are used for analysis.

This Technical Report generates a number of benefits for the user:

Usefulness	the user can examine the electrochemical migration test in a short time, and can use it as an indicator of exact analysis.
Test method selection	since for the user the test method which responds to the operating condition of the equipment or the purpose is clearly demonstrated, comparison of test condition becomes easy. Compared to the measurement resistance of a specimen while it is taken out of the test chamber after the test chamber is return to the standard atmosphere condition, the measurement in the test chamber by automatic measurement does not experience the environmental change of a specimen at the time of measurement, and since continuous measurement can be carried out, the resistance change and failure time can be grasped correctly.
Avoidance of trouble	by observing the notice on the test, the user can avoid a trouble and carry out test and analysis efficiently.

ELECTROCHEMICAL MIGRATION IN PRINTED WIRING BOARDS AND ASSEMBLIES – MECHANISMS AND TESTING

1 Scope

This Technical Report describes the history of the degradation of printed wiring boards caused by electrochemical migration, the measurement method, observation of the failure and remarks to testing in detail.

2 Electrochemical migration

NOTE Electrochemical migration is sometimes called ion migration. In this technical report electrochemical migration/ion migration will be referred to as migration.

2.1 Operation failure of electronic and electric equipment

It is known that failures caused by various degradation phenomena occur in electric and electronic products while they are used in the field. Causes of such failures are classified in Figure 1. The causes may be classified into: electric, thermal, mechanical and electrochemical origins. They are entwined with each other. The environment in which equipment is used also affects the generation of failures.

Growth of an electrically conducting filament caused by migration will short-circuit two conductors when a bias voltage is applied between them and will lead to a malfunctioning in the equipment.

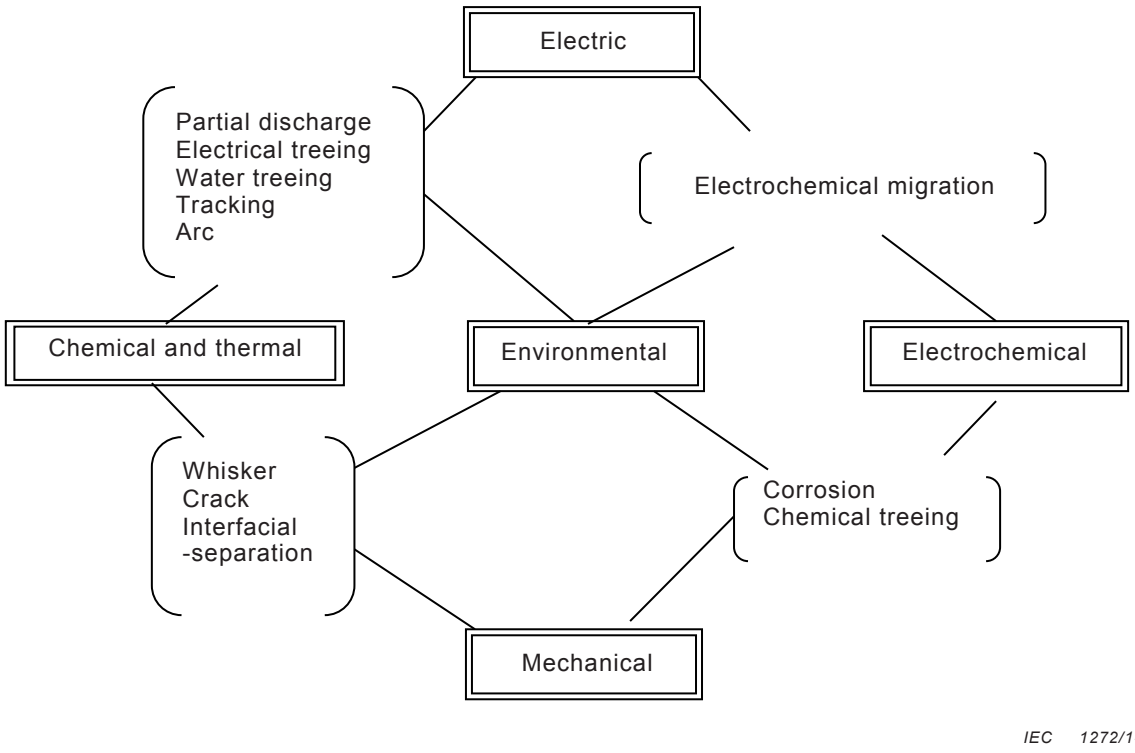

Figure 1 – Main causes of insulation degradation in electronic equipment