Press Resease

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A definite "out" for lead containing materials

Electronic equipment without hidden poisons

Until recently tin-lead solders were extensively used for connectivity purposes in the electronic industry. However, since on July 1, 2006, a new European Community law forbidding the use of lead in electronic equipment became effective, Empa researchers have been busy helping the industry to find substitute alloys and convert production techniques to new lead-free solders.

In a common electronic appliance such as a cell phone, one can find hundreds soldering joints on the phone's circuit board. Until now solders made out of tin and lead were extensively used by the industry in order to connect components with the circuit board. However, since July 1, 2006, this is no longer allowed, as on that day the European Community's regulation "RoHS" (restriction on the use of certain hazardous substances) took effect. This regulation forbids the use of certain health and environmentaly hazardous substances, in electronics production. Thus, cadmium, mercury, chrome and its various alloys as well as the flame retardents PBBC and PBDE are all prohibited. In Switzerland also, is such a regulation in force: the Swiss Chemical Risk Reduction Regulation (ChemRRV) has been law since August 1, 2005.

Substitutes must be found for poisonous materials

The use of tin and lead solders is problematic because poisonous lead accumulates in organisms along the food chain and from there it is impossible to remove or reduce it. The new law therefore prescribes that "homogeneous materials must not contain lead in concentrations of more than 0.1%". In the Eureka “Lead-free” project, financed by the European Community, Empa scientists have been working already for the past five years, on finding alternatives to tin-lead solders used until recently. The electronic industry's ideal alternative solder must be reliable, cost effective, have a low melting temperature, can be utilized in existing production technologies and in addition must not contain any new environmental poisons. Out of some 200 various alloys considered, the Empa scientists together with researchers from the Fraunhofer Institute ISIT in Itzehoe (Germany), the Technical University Vienna, and many other European industrial partners, chose five alloys which could serve as future electronic solders.

Empa's knowledge and experience with reliability

Soldering joints must not fail prematurely, since a single defective solderjoint can silence a cell phone. However, converting a solder from a lead-containing to a lead-free one, causes new problems: substitute solders in a fluid state have a higher melting temperature and have an aggressive effect on many metals. In these circumstances, damage may occur not only to the electronic components but even to entire production facilities. The new soldering process using lead free solders such as tin connectors demands therefore a higher level of standards in industrial productions. Here, Empa contributed and still contributes a lot to the development of these standards, by, for instance, sharing its experience and knowledge about the reliability of electronic systems. As an example, Empa demonstrated how damage caused by overheating of components or in solder joints, can be avoided, already at the theoretical stage – at the actual planning – and execution of the manufacturing process. In addition, a PhD work at Empa showed a model of the deformation behavior of the most popular lead-free solder, a tin-silver-copper alloy (SnAg3.8Cu0.7).

Do material components comply with the new law?

Analyzing the amount of lead present in individual components has proven a most difficult task, since often even the smallest components are composed of various materials. Without a detailed and costly physical-chemical analysis it cannot be determined if more or less than 0.1% lead totally is present in the component parts. Empa possesses X-ray machines with which such various components can be "screened" for purposes of laboratory scale measurements of lead. Such machines, however, are too expensive for industrial purposes, and the legislature must therefore determine how future compliance with the new rules can be controlled.

Empa shall continue to occupy itself in coming years with the questions of the reliability and the analysis of "ROHS" compatible technologies and substances. To begin with, Empa shall continue its research within the scope of the Eureka "Lead-free" project, and other projects in the 7. European Community's Research Program. One stated goal is to make available to manufacturers an easy access to information as to which electronic components are compatible with the "RoHS" regulation. For that purpose, Empa's published Compatibility Guide will be expanded and brought up to date.

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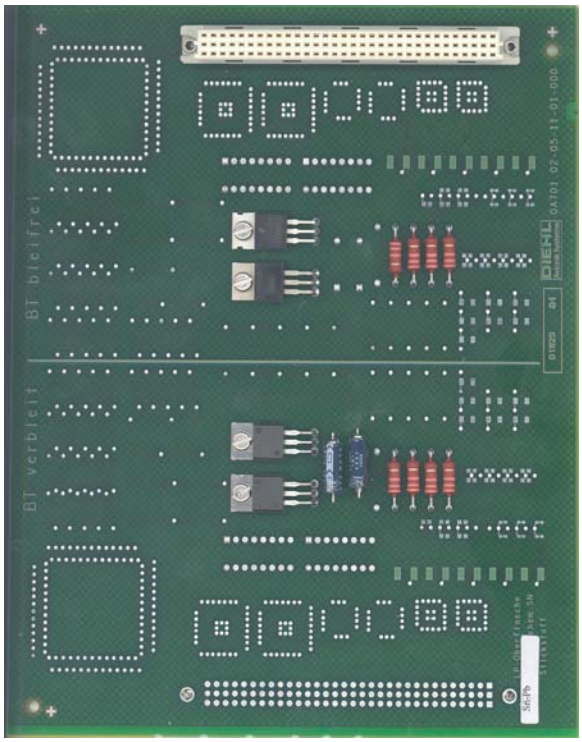

When solder joints on a circuit board are damaged or when the components are overheated, the electronic appliance doesn't work.