NIST Supports Industry Compliance with the EU Directive on Restriction of Certain Hazardous Substances (RoHS)

NIST is involved in standards development and reference material certification for restricted substances in materials through participation in international test method development programs, providing Standard Reference Materials (SRMs) for test method validation, and investing in development of new SRMs. NIST involvement with RoHS is based in large measure on feedback obtained during a NIST workshop in October 2005, which resulted in a prioritized list of materials for new SRMs. Current projects include production of SRMs for lead-free solder and polymers containing high levels of restricted substances. Collaborations are underway with the National Institute of Metrology of China (NIM-C) and the Institute for Reference Materials and Measurements (IRMM) of the European Union (EU).

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The EU RoHS Directive is the first of a number of regulations from the EU, China, Korea, California, and other governments restricting levels of hexavalent chromium (Cr^{+6}), cadmium (Cd), mercury (Hg), lead (Pb), polybrominated biphenyls (PBB), and polybrominated diphenylether (PBDE) compounds in electronic and electrical products.

Recent estimates place the costs of compliance in these industries at nearly $100 billion because the restrictions created expensive consequences throughout the entire supply chain:

1. Manufacturers must either test their products or rely on testing done by components suppliers.
2. Manufacturers must share all declared composition data throughout the supply chain.
3. Manufacturers must replace materials containing high levels of restricted substances, e.g., lead-tin solder, and redesign products for reliable operation.

Manufacturers' in-house laboratories and commercial testing labs worldwide need valid test methods to meet the high demand for testing of alloys, coatings, polymers, resins, glass, and other materials. Certified reference materials (CRMs) are needed to support test methods.

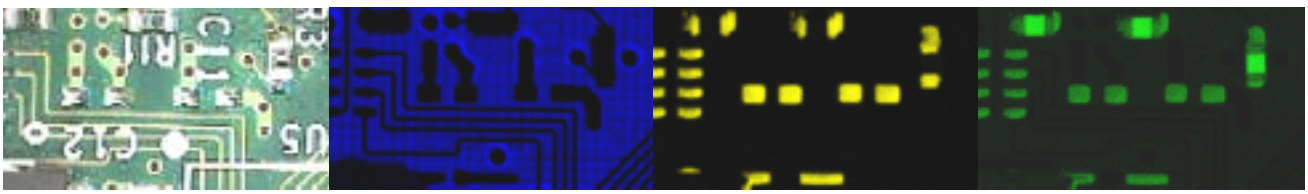
NIST was well-positioned to respond to these needs. In 2005 NIST representatives joined standards development committees of the International Electrotechnical Congress (IEC) and ASTM International. A NIST workshop brought together industry experts and provided prioritization of SRM and method development projects.

***Standards Development Activities*:** In January 2005 ASTM International Committee F40 on Declarable Substances in Materials was organized with NIST as one of over 100 charter members. F40 has published several standards related to restricted substances. Important test methods for solder and polymers are under development.

In early 2006, NIST provided SRMs used in validation studies of the methods for Cd and Pb in aluminum and steel alloys in a draft standard from IEC Technical Committee 111. The methods for steel and aluminum were shown to be valid, but other methods for glass, polymers, and coatings on alloys were not successfully validated, due in part to a lack of CRMs.

***Certified Reference Materials*:** In 2006 NIST initiated projects to develop new SRMs for plastics and lead-free solder containing known concentrations of restricted substances. Progress was made in development of an SRM containing known concentrations of PBDE compounds in solution, and house dust SRM 2585 was certified for the same compounds. Additionally, NIST determined flame retardant concentrations in a polymer CRM under development by IRMM. Three materials for use as SRM 2855 Additive Elements in Polyethylene have been developed in cooperation with ASTM.

***Future Plans*:** Standards committee activities will involve participation in validation studies for IEC TC111 and ASTM F40 method development for coatings, solder, and plastic. SRM development projects for solder and plastic are slated for completion during 2007. A new project is underway to create a candidate material for elements in polyvinylchloride (PVC) in collaboration with NIM-C. Researchers are developing new test methods for analysis of polymers by inductively coupled plasma optical emission spectrometry and X-ray fluorescence spectrometry.



X-ray map of elements in circuit board (2 cm^2 area): (l to r) Photo, Br flame retardant, Sn solder, Pb solder + ceramic