



THE Ames Laboratory  
Creating Materials & Energy Solutions

## A green alternative to lead-based solder

*The Ames Lab lead-free solder alloy was first patented in 1996. Today, more than 60 companies have received licenses to market it throughout the world.*

Solder's use has expanded in tandem with the ever-increasing number of electronic devices we use each day. In order to work, any solder must be able to melt at a lower temperature than the delicate components it is wiring together. At the same time, all solders must be able to withstand wide variations in temperature and hold together when dropped or subjected to long-term usage.

To meet these requirements, manufacturers have for decades relied on solder made from lead, a metal whose health hazards are well documented. Govern-

ments everywhere have sought to restrict its use. Lead is banned from gasoline and paint. U.S. legislation that became law in early 2009 has effectively banned its presence in toys and other children's products.

of lead in electronic devices sold there since 2006. Similar regulations could be enacted in the United States as well. Meanwhile, consumers increasingly are demanding green products, a demand that's spurred on by mandates within corporations and governmental entities.

Despite these strong regulatory and market-based pressures, the job of selecting an alternative to lead-based solder remains complex for companies. Numerous varieties exist, each with unique characteristics that must be matched to the demands of myriad

***"We are interested in the capabilities of this new lead-free solder. It has a higher metallurgical strength than other solders presently available and other metallurgical properties that give it a long life."***

*-Alan Gickler, general manager of Johnson Manufacturing, a solder manufacturing company planning to produce Ames Lab's lead-free solder for use in the heat exchanger industry.*

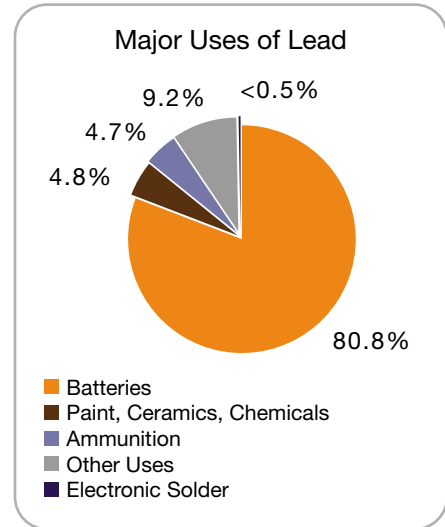
ments everywhere have sought to restrict its use. Lead is banned from gasoline and paint. U.S. legislation that became law in early 2009 has effectively banned its presence in toys and other children's products.

Today, electronics manufacturers everywhere face the prospect of replacing the lead-based solder used in their products with lead-free alternatives. The European Union has restricted the use

applications. For example, a lead-free solder alloy used in a motor vehicle's wiring system – one subject to continual, wide temperature swings and vibration – might not be optimal for a cell phone, which must withstand both temperature variations and shock.

The U.S. Department of Energy's Ames Laboratory has developed and extensively tested a lead-free solder alloy able to

## Lead in Electronics



Source: World Semiconductor Council

satisfy many of industry's most stringent requirements. The Ames Laboratory lead-free solder is licensed worldwide and is available for non-exclusive licensing. The solder is a combination of tin, silver and copper. Tests show the Ames Lab solder exhibits higher strength than lead-based alternatives. Its 217° C melting point makes it a viable choice for the increasing number of electronic components placed under the hood of motor vehicles. Temperatures there can easily reach 150° C, causing typical tin-

**For licensing information and specifications, please contact:**  
**Deb Covey**, Associate Director  
515-294-1048  
covey@ameslab.gov  
111 TASF, Ames, IA 50011-3020

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lead solder with a 183° C melting point to become pliant and subject to failure.

In addition to durability, the Ames Lab's lead-free solder has one more distinct advantage, a commitment by the Ames Lab to continually test and improve the product, insuring that it will become the principal "green" solder alternative for a growing number of applications in the electronics industry.

### **Ames Lab lead-free solder: Notable Advantages**

- 1.** A thoroughly tested alternative to lead-based solder, developed under the rigorous guidelines of a U.S. Department of Energy research facility.
- 2.** With a cost structure lower than some other lead-free solder alternatives, the Ames Lab alloy is a competitive choice for electronics manufacturers who wish to comply with EU restrictions on lead contained in electronic components.
- 3.** Heat tolerances superior to lead-based solders that make the Ames Lab alloy ideal for high-stress applications, such as the growing number of under-hood electronics systems in motor vehicles.
- 4.** Ames Lab is committed to its product's continued refinement.