ENGLISH SUMMARY

CONSTITUTIVE EQUATIONS FOR SOLDER METALS

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Journal of Structural Mechanics, Vol. 32
Nos. 1-2, 1999, pp. 25-39

In electronic industry the use of leadless surface mounted components has increased. During operation the temperature of components and circuit board (PWB) changes. This will cause thermal stresses into the joints between components and PWB because the coefficient of thermal expansion of the components and the circuit board are different. In these small solder joints the importance of the fatigue properties of the solder material has increased.

The fatigue life of a solder joint, i.e. when the electrical connection is broken, depends on its deformation history. In electronic devices the operation temperature is normally more than half of the melting point of the solder metals. In this temperature region the dominant deformation mechanism is creep.

In this article few creepmodels and some microstructural phenomenons are introduced. Creep deformation and microstructure have an influence on each other. Changes in the microstructure (e.g. grain size) changes the creep properties and vice versa. Nevertheless in most creep models the microstructure has no influence. The changes of the microstructure may have a great influence on the behavior of a solder joint during long time loadings. So in reliable lifetime and other calculations the microstructure and its evolution should be taken into account.

Nowadays quite little is known about the influence of the deformation history to the microstructure and vice versa. When does the solder recrystallize? What influence the chemical processes have on mechanical properties and why the deformation increases grain growth rate? All of these phenomenons changes the microstructure and the mechanical properties of solders. In articles [1] and [5] the development of some microstructural parameters and their evolution is included in the model. These models are not good enough so the laboratory of Electronics Production in HUT has started a project to get better understanding on the phenomenons that affect the fatigue and the mechanical properties of solders.