Surface Wettability & Surface Flatness

Surface Wettability :

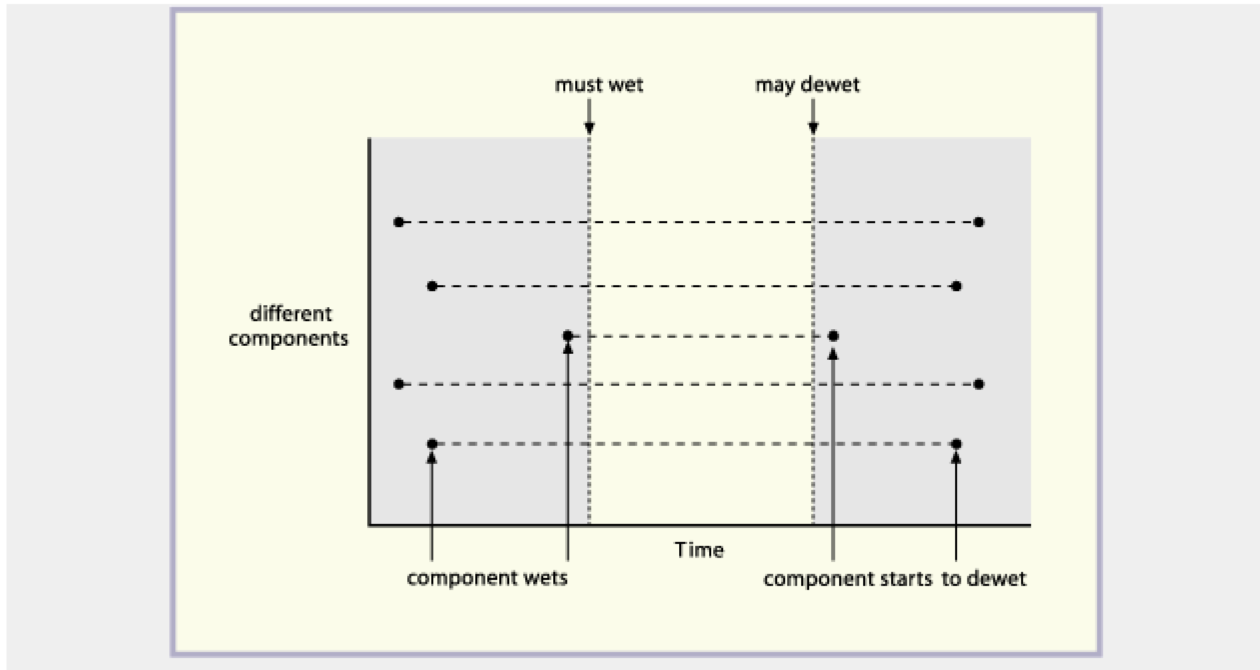
In order for a joint to be made, the solder needs to *wet* the conductive surfaces on the board and the component within the process time available. There are two measures of surface wettability which impact on the ability of component and board metallisation to make a satisfactory joint:

1. *degree* of wetting: how *far* the solder spreads
2. *rate* of wetting: how *fast* the solder wets and spreads

Related to these, and often tested at the same time, is the capacity of the metallisation to withstand exposure to molten solder without dewetting.

Such tests are related to the 'process window' shown in Figure 1. This indicates diagrammatically the way in which a surface is first wetted by solder, and then at a later stage dewetted.

Figure 1: A process window for soldering



Note that different components show different characteristics; some wet quickly, others take a long time to wet. Similarly, some components are resistant to dewetting (take a long time to do this) whereas others dewet quickly.

Typically those components which wet quickly take a long time to dewet, whereas those that wet poorly dewet first. The process window is between the time when a component must wet (given the soldering conditions obtaining) and the first occasion on which components may dewet.

Surface flatness

Flatness is an issue which occurs both in relation to the flatness of the board as a *whole* and to the flatness of the pads on its surface. The requirement is two-fold:

- In the first instance, the leads of any component have to make contact with the solder paste in order for joints to be formed. Because slight pressure is applied to a component during placement, we normally allow the lead to depress the paste only to around half its original height, in order to reduce possible bridging, this means that the surface on the area of the component has to be flat within half the paste height, that is typically 75µm.
- The component lead has to be in contact with sufficient solder to enable the joint created to have the right volume. As you will realise, joints which are “insufficient” have reduced reliability.

One further consideration is that the pads themselves should be sufficiently flat to avoid components placed on them skidding off during placement.

So we are looking for flatness and evenness of coating, and the requirements get more difficult to achieve with fine pitch components and with area devices such as BGAs and µBGAs. For such applications a HASL surface is generally not used, because it is not very flat, the deviation from flatness depending partly on the pad design, and partly on the board vendor.

Source : http://www.ami.ac.uk/courses/topics/0148_swet/index.html