Electrical connection pads with improved solderability

Reference No: B79040

CHALLENGE
The most common metallic materials used in the printed circuit board (PCB) technology are copper and brass. Due to their high chemical reactivity, these metals quickly form a thin passivation layer under the influence of air. This significantly decreases the solderability and limits the shelf life of PCBs. Hence, the PCBs are necessarily pre-processed (e.g. gold-plated, additionally coated, chemically cleaned). That makes them more expensive and increases the complexity of the electronic component assembly process.

INNOVATION
The innovation describes a selective laser treatment and functionalization of the PCB surface. By applying ultrashort pulsed laser light to the solder pads, their surface chemistry and morphology is modified in such a way that the wettability of the solder surface is improved. The laser treatment creates a nearly periodic surface structure in the nanometer range and hence enlarges the wettable surface area while simultaneously removing the above-mentioned passivation layer. The created nano-structure is visible to the naked eye and makes process control very easy.

COMMERCIAL OPPORTUNITIES
✓ Applicable to almost any connection pad material.
✓ Applicable to modern multilayer PCBs, due to minimal material removal.
✓ Simultaneous changes to the surface chemistry, morphology and surface area.
✓ Improved wettability enables lead-free solder (RoHS compliant!).
✓ Laser can be used for additional in line process steps like cutting or via drilling.
✓ Further applicable to improve surface adhesion for bonding or gluing processes.

DEVELOPMENT STATUS
The effectiveness of the invention has already been demonstrated. The current work on laser scanning strategies is aiming at improved process speed.

Fig. 1: Comparison between 3 surfaces. (I) Polished Cu with a storage time of 14 days. (II) Polished and laser structured Cu surface stored for 14 days under lab conditions. (III) Oxidized surface with a "fresh" laser treatment directly before the solder test.

Fig. 2: Easy process control thanks to the colourful interference effects when light is reflected on the surface of the structured solder pads.