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Purpose: The aim of this work is to investigate the decomposition behaviour of the activator species commonly used in the wave solder no-clean flux systems and to estimate the residue amount left after subjecting the samples to simulated wave soldering conditions.
Design/methodology/approach: Changes in the chemical structure of the activators were studied using Fourier transform infrared spectroscopy technique and were correlated to the exposure temperatures within the range of wave soldering process. The amount of residue left on the surface was estimated using standardized acid-base titration method as a function of temperature, time of exposure and the substrate material used.
Findings: The study shows that there is a possibility of anhydride-like species formation during the thermal treatment of fluxes containing weak organic acids (WOAs) as activators (succinic and DL-malic). The decomposition patterns of solder flux activators depend on their chemical nature, time of heat exposure and substrate materials. Evaporation of the residue from the surface of different materials (laminate with solder mask, copper surface or glass surface) was found to be more pronounced for succinic-based solutions at highest test temperatures than for adipic acid. Less left residue was found on the laminate surface with solder mask (~5-20 per cent of initial amount at 350°C) and poorest acid evaporation was noted for glass substrates (~15-90 per cent).
Practical implications: The findings are attributed to the chemistry of WOAs typically used as solder flux activators. The results show the importance WOA type in relation to its melting/boiling points and the impact on the residual amount of contamination left after soldering process.
Originality/value: The results show that the evaporation of the flux residues takes place only at significantly high temperatures and longer exposure times are needed compared to the temperature range used for the wave soldering process. The extended time of thermal treatment and careful choice of fluxing technology would ensure obtaining more climatically reliable product.

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