In some aspects, the solder flux composition has good wettability on metal coupons in an industry-standard wetting balance test when compared with a control flux. In some aspects, the flux compositions have improved ability to remove oxidation from an oxidized metal surface.

In one aspect, there is provided a mixture comprising solder and the composition described herein.

In another aspect, there is provided a method of making a solder flux composition, the method comprising: (a) combining 40 to 60 wt.% of an alkylbenzene sulfonic acid or an acidic phosphate ester with 40 to 60 wt.% of an alkanolamide, an ethoxylated alkanolamide, an alkanolamine, or an ethoxylated amine, and (b) mixing until the composition is substantially homogeneous.

The invention includes methods of making solder flux compositions and methods of using the inventive compositions as components of tacky solder fluxes.

We surprisingly found that solder flux compositions having excellent wettability, oxide-removal capability, and rheological characteristics for high-speed, pick-and-place manufacturing processes can be made from a simple combination of two components thereby avoiding the need for solvents, polymeric thickeners, and other components of traditional tacky solder fluxes.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plot from a dynamic shear rheometry (DSR) experiment measuring viscosity (Pa•s) versus shear rate (s^{-1}) for a 50:50 (wt/wt) blend of BIO-SOFT® S-126 (dodecylbenzene sulfonic acid) and TOXIMUL® TA-2 (tallowamine 2EO ethoxylate).

Fig. 2 is a plot from a similar DSR experiment for ZELEC® NK, an alcohol phosphate ester neutralized with an equivalent of diethanolamine.

Fig. 3 is a plot from a similar DSR experiment for a 50:50 blend of ZELEC® UN, an acidic alcohol phosphate ester, and TOXIMUL® TA-2.

Fig. 4 is a plot from a similar DSR experiment for a 50:50 blend of CEDEPHOS® FA-600, an acidic alcohol phosphate ester, and TOXIMUL® TA-2.

Fig. 5 is a plot from a similar DSR for a 50:50 blend of CEDEPHOS® FA-600 and NINOL® 1301 (cocamide PEG-6).

Fig. 6 is a comparative plot from a DSR experiment measuring viscosity versus shear rate for a 60:40 blend of BIO-SOFT® S-126 and TOXIMUL® TA-2.

Fig. 7 is a comparative plot from a similar DSR experiment for a 50:50 blend of BIO-SOFT® S-126 and TOXIMUL® TA-5 (tallowamine 5EO ethoxylate).

Fig. 8 is a comparative plot from a similar DSR experiment for a 50:50 blend of BIO-SOFT® S-126 and TOXIMUL® TA-15 (tallowamine 15EO ethoxylate).