CHAPTER III

EXPERIMENTAL

3.3.1 Chemicals

WW rosin was purchased from Luxes Chem Co., Ltd. and hydrogenated rosin was purchased from Arakawa Chemical Industries, Ltd.

Solvents such as PEG 200, PEG 300, toluene, 2-propanol, propylene glycol, diethylene glycol diethyl ether were purchased from Merck Co., Ltd.

Activators such as succinic acid, adipic acid, and dimethylammonium chloride were purchased from Merck Co., Ltd.

Thickener agents such as ozokerite were purchased from the Sun Chemical Co., Ltd.

The solder powder 63/37 Sn/Pb particle size type III, Q3 and 5T solder paste flux purchased from Singapore Asahi Chemical and Solder Industries Pte Ltd.

3.4 Instruments and apparatus

The viscosity of the solder paste flux was measured by Brookfield digital viscometer model DV-I+ version 3.2. The glass slide for slump and tackiness test was Frosted glass microscope. Metal mask stencil for solder paste printing was 1-7 with 76 mm x 25 mm x 0.2 mm dimension. Digital hotplate/stirrer was PCM 750 series. Microscope (CARTON model) was 10 to 20 X magnifications. The temperature of testing method was controlled by Memmert oven (model 100). The electrical insulation resistance was measured by IR-TESTER (Quantech 1865 Megohmmeter). The solder was melted by solder bath (UP-2A model, ULTRACORE CO., LTD.). The slump test was measured by digital vernier caliper (Mitutoyo). Temperature was measured by BONKOTE digital thermometer (model MCA-900). The temperature and humidity measured by ISUZU electronic precision thermo-hydrograph. The specimens were weighted by BL-2200H SHIMADZU electronic balance. The solder paste and solder paste flux were mixed by HR1456 PHILIPS mixer.

3.3 Experimental procedure

3.3.1 Solder paste flux preparation

The weights in gram of components used in solder paste flux are shown in Table 3.1, 3.2 and 3.3. KE604 was added into diethylene glycol diethyl ether. The mixture was heated at 125(82-127)°C and stirred by spatula until KE-604 was completely melted. Ozokerite wax was added into the mixture, which keep on stirring at 200 r.p.m. and maintain temperature at 125°C. Succinic acid was added into the mixture and heating and stirring at 200 r.p.m. were continued until it was completely melt. After the mixture became a clear solution, heating was continued for 25 minutes. The container of the clear solution was moved and placed in a cold bath at 0-10°C and stirring was continued until the temperature of mixture was cool down below 32°C forming a clear paste.

Table 3.1 The formula of solder paste fluxed at various concentration of KE604 and diethylene glycol diethyl ether.

Composition	Formulation				
	1	2	3	4	5
KE604	55	60	65	70	75
Diethylene glycol diethyl ether	40	35	30	25	20
Succinic acid	1	1	1	1	1
Ozokerite	4	4	4	4	4
Total	100	100	100	100	100

Table 3.2 The formula of solder paste fluxes at various concentration of ozokerite wax

Composition	Formulation (%wt)						
	1	2	3	4	5	6	7
KE604	65	65	65	65	65	65	65
Diethylene glycol diethyl ether	30	30	30	30	30	30	30
Succinic acid	1	1	1	1	1	1	1
Ozokerite	0	2.5	5	7.5	10	12.5	15
Total	96	98.5	101	103.5	106	108.5	111

Table 3.3 The formula of solder paste fluxes at various concentration of succinic acid

Compositions	Formulation					
	1	2	3	4	5	6
KE604	63	63	63	63	63	63
Diethylene glycol diethyl ether	29	29	29	29	29	29
Succinic acid	0	1	2	3	4	5
Ozokerite	7	7	7	7	7	7
Total	99	100	101	102	103	104

3.3.2 Solder paste preparation

A 250 ml beaker was cleaned thoroughly with lint free tissue wetted with IPA. The beaker was placed on the balance capable of weighing to 1000 grams and with a tolerance of 0.01 g. The balance was tarred. The 10 grams of solder paste flux were weighed and tarred. The beaker was moved back onto the balance and tarred.

The 90 grams of solder powder were weighed into the beaker. The solder paste flux and solder powder were mixed together by spatula with same direction. Ensure that there was no unmixed solder paste flux or solder powder at the corner of the beaker by checking the metal content which must be $\pm$ 0.5 %.

3.3.3 Storage condition

The solder paste fluxes (2 samples) were stored at 0- 10^{O}C and 11-35 ^{O}C for three months and the appearance, viscosity, slump, wetting and dewetting effect, corrosion and electrical insulation resistance were measured.

3.3.4 Solder paste flux quality testing methods

The solder paste flux quality was evaluated by using various methods specified by JIS Z 3284 and others as shown in detail in Appendix B such as

3.3.4.1 Viscosity test

3.3.4.2 Tackiness test

3.3.4.3 Electrical insulation resistance test

3.3.4.4 Corrosive test

3.3.4.5 Slump in heating test

3.3.4.6 Wetting and dewetting effect test