## List of Figures

Figure1.1 Direct drop calorimeter
Figure 1.2 Solution drop calorimeter
Figure 1.3 Multi-Sample Introducer
Figure 1.4 High Temperature Furnace
Figure 1.5 MHTC96 High Temperature Drop Calorimeter41
Figure 2.1 Molten salt electrolyte galvanic cell assembly
Figure 2. 2 Plan of the Galvanic cell assembly for the activity measurement50
Figure 2.3 Illustrations on triangular coordinates of compositions to be
investigated in ternary system for proposed method of obtaining excess molar
properties for the binary system 1-354
Figure 2.4 Experiment Programming
Figure 3.1 Composition selected for activity measurement
Figure 3.2 EMF vs Temperature plot of Galvanic cell a) $In(1) KCl-LiCl In_x(Sn_{0.33}) KCl-LiCl$
$Bi_{0.67})_{1-x}(l) \hspace{0.1in} b)In(l) KCl-LiCl In_x(Bi_{0.5}Sn_{0.5})_{1-x}(l) \hspace{0.1in} and \hspace{0.1in} c) \hspace{0.1in} In(l) \hspace{0.1in}   \hspace{0.1in} KCl-LiCl \hspace{0.1in}   \hspace{0.1in} In_x(Sn_{0.67})_{1-x}(l) \hspace{0.1in} and \hspace{0.1in} c) \hspace{0.1in} In(l) \hspace{0.1in}   \hspace{0.1in} KCl-LiCl \hspace{0.1in}   \hspace{0.1in} In_x(Sn_{0.67})_{1-x}(l) \hspace{0.1in} and \hspace{0.1in} c) \hspace{0.1in} In(l) \hspace{0.1in}   \hspace{0.1in} KCl-LiCl \hspace{0.1in}   \hspace{0.1in} In_x(Sn_{0.67})_{1-x}(l) \hspace{0.1in} and \hspace{0.1in} c) \hspace{0.1in} In(l) \hspace{0.1in}   \hspace{0.1in} KCl-LiCl \hspace{0.1in}   \hspace{0.1in} In_x(Sn_{0.67})_{1-x}(l) \hspace{0.1in} and \hspace{0.1in} c) \hspace{0.1in} In(l) \hspace{0.1in}   \hspace{0.1in} KCl-LiCl \hspace{0.1in}   \hspace{0.1in} In_x(Sn_{0.67})_{1-x}(l) \hspace{0.1in} and \hspace{0.1in} c) \hspace{0.1in} In(l) \hspace{0.1in}   \hspace{0.1in} KCl-LiCl \hspace{0.1in}   \hspace{0.1in} In_x(Sn_{0.67})_{1-x}(l) \hspace{0.1in} and \hspace{0.1in} c) \hspace{0.1in} In(l) \hspace{0.1in}   \hspace{0.1in} KCl-LiCl \hspace{0.1in}   \hspace{0.1in} In_x(Sn_{0.67})_{1-x}(l) \hspace{0.1in} and \hspace{0.1in} c) \hspace{0.1in} In(l) \hspace{0.1in}   \hspace{0.1in} KCl-LiCl \hspace{0.1in}   \hspace{0.1in} In_x(Sn_{0.67})_{1-x}(l) \hspace{0.1in} and \hspace{0.1in} c) \hspace{0.1in} In(l) \hspace{0.1in}   \hspace{0.1in} In_x(Sn_{0.67})_{1-x}(l) \hspace{0.1in} and \hspace{0.1in} c) \hspace{0.1in} In(l) \hspace{0.1in}   \hspace{0.1in} In(l)  0.1i$
Bi <sub>0.33</sub> ) <sub>1-x</sub> (l)
<b>Figure 3.3</b> Activity of Indium in In-Sn,In-Bi and $(Sn_{0.33}Bi_{0.67})_{1-x} In_x$ ; $\blacksquare$ , $(Sn_{0.50}Bi_{0.50})_{1-x} In_x$ ;
▲ and $(Sn_{0.67}Bi_{0.33})_{1-x}$ In <sub>x</sub> ; •
Figure 3.4 Isoactivity lines of Indium in the Bi-In-Sn liquid alloys at 813K81
Figure 3.5 Iso Gibbs free energy curve Bi-In-Sn ternary alloy.87
Figure 3.6 Free energy function of In in Bi-In-Sn alloys at 813K
<b>Figure 3.7</b> $G^{xs}$ as a function of $x_{In}$ at 813K.89
Figure 3.8 Comparison of excess molar free energy between theoretical model and this
study at 813K for $(Sn_{0.67}Bi_{0.33})_{1-x}$ In <sub>x</sub>
Figure 4.1 Integral molar mixing enthalpies of liquid Bi-Sn alloys at 767, 813 and 855
К106
Figure 4.2 Integral molar mixing enthalpies of liquid Bi-In alloys at 767, 813 and 855
К
Figure 4.3 Integral molar mixing enthalpies of liquid In-Sn alloys at 767, 813 and 855
K

V

vi

Figure 4.4 Comparison of Integral molar mixing enthalpies between theoretical model (Redlich-Kister Polynomial) and this experimental study at 767 K for Bi-Sn alloys......111 Figure 4.5 Comparison of Integral molar mixing enthalpies between theoretical model (Redlich-Kister Polynomial) and this experimental study at 813 K for Bi-Sn Figure 4.6 Comparison of Integral molar mixing enthalpies between theoretical model (Redlich-Kister Polynomial) and this experimental study at 855 K for Bi-Sn Figure 4.7 Comparison of Integral molar mixing enthalpies between theoretical model (Redlich-Kister Polynomial) and this experimental study at 767 K for Bi-In Figure 4.8 Comparison of Integral molar mixing enthalpies between theoretical model (Redlich-Kister Polynomial) and this experimental study at 813 K for Bi-In Figure 4.9 Comparison of Integral molar mixing enthalpies between theoretical model (Redlich-Kister Polynomial) and this experimental study at 855 K for Bi-In Figure 4.10 Comparison of Integral molar mixing enthalpies between theoretical model (Redlich-Kister Polynomial) and this experimental study at 767 K for In-Sn Figure 4.11 Comparison of Integral molar mixing enthalpies between theoretical model (Redlich-Kister Polynomial) and this experimental study at 813 K for In-Sn Figure 4.12 Comparison of Integral molar mixing enthalpies between theoretical model (Redlich-Kister Polynomial) and this experimental study at 855 K for In-Sn Figure 5.1 Compositions of the investigated cross sections along which mixing enthalpy were measured at three cross-sections:  $(Sn_{0.33}Bi_{0.67})_{1-x} In_x$ ;  $\blacktriangle$ ,  $(Sn_{0.50}Bi_{0.50})_{1-x}$ Figure 5.2 Integral molar mixing enthalpies of liquid Bi-In-Sn alloys along cross section of  $(Sn_{0.33}Bi_{0.67})_{1-x} In_x$ ;  $\blacksquare$ ,  $(Sn_{0.50}Bi_{0.50})_{1-x} In_x$ ;  $\bullet$  and  $(Sn_{0.67}Bi_{0.33})_{1-x} In_x$ ;  $\blacktriangle$  at 767 K; standard states: pure liquid metals......134

Figure 5.3 Integral molar mixing enthalpies of liquid Bi-In-Sn alloys along cross
section of $(Sn_{0.33}Bi_{0.67})_{1-x} In_x$ ; $\blacksquare$ , $(Sn_{0.50}Bi_{0.50})_{1-x} In_x$ ; $\bullet$ and $(Sn_{0.67}Bi_{0.33})_{1-x} In_x$ ; $\blacktriangle$ at 813
K; standard states: pure liquid metals
Figure 5.4 Integral molar mixing enthalpies of liquid Bi-In-Sn alloys along cross
section of $(Sn_{0.33}Bi_{0.67})_{1-x} In_x$ ; $\blacksquare$ , $(Sn_{0.50}Bi_{0.50})_{1-x} In_x$ ; $\bullet$ and $(Sn_{0.67}Bi_{0.33})_{1-x} In_x$ ; $\blacktriangle$ at 855
K; standard states: pure liquid metals
Figure 5.5 Integral molar mixing enthalpies of liquid Bi-In-Sn alloys along cross
section of $(Sn_{0.33}Bi_{0.67})_{1-x}$ In <sub>x</sub> at 767 K; $\Box$ , 813 K; • and 855 K; $\Delta$ , — trend line,
standard states: pure liquid metals
Figure 5.6 Integral molar mixing enthalpies of liquid Bi-In-Sn alloys along cross
section of $(Sn_{0.50}Bi_{0.50})_{1-x}$ In <sub>x</sub> at 767 K; $\Box$ , 813 K; • and 855 K; $\Delta$ , — trend line,
standard states: pure liquid metals