Erratum to: Thermodynamic Modeling of the Fe-Mn-C and the Fe-Mn-Al Systems Using the Modified Quasichemical Model for Liquid Phase

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The authors regret the following typing errors in Tables 3 and 4, the correct tables are (corrected part is seen with arrow (→)):

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Table 3 Summary of model parameters in the Fe-Mn-C system (J/mol)

Phase	Model	Parameter
Liquid	(Fe,Mn,C)	$Z_{\text{FeFe}}^{\text{Fe}} = Z_{\text{MnMn}}^{\text{Mn}} = Z_{\text{CC}}^{\text{C}} = Z_{\text{FeMn}}^{\text{Fe}} = Z_{\text{FeMn}}^{\text{Mn}} = Z_{\text{FeC}}^{\text{C}} = Z_{\text{MnC}}^{\text{C}} = 6, Z_{\text{FeC}}^{\text{Fe}} = Z_{\text{MnC}}^{\text{Mn}} = 3$ $\Delta g_{\text{FeC}} = -30459.5 + 3.14T - 1129.7X_{\text{FeFe}}^{[4]}$ $\Delta g_{\text{FeMn}} = -1338.9 + 0.17T - 334.7X_{\text{MnMn}} + 418.4X_{\text{FeFe}}^{[9]}$ $\Delta g_{\text{MnC}} = -42677 + 4.50T + (2092 + 1.75T)X_{\text{MnMn}}^{[5]}$ $\Delta g_{\text{FeMn(C)}} = -8368 + 9623X_{\text{MnMn}}$ “Toop-like” interpolation (C as the asymmetric component) ^[52]
fcc	(Fe,Mn) ₁ (C,Va) ₁	$G_{\text{Fe:Va}} = \text{GFCCFE}, G_{\text{Mn:Va}} = \text{GFCCMN}$ $G_{\text{Fe:C}} = \text{GFCCFE} + \text{GHSERCC} + 77207 - 15.88T^{[23]}$ $G_{\text{Mn:C}} = \text{GHSERMN} + \text{GHSERCC} + 13.66T^{[30]}$ $L_{\text{Fe,Mn:Va}} = -7762 + 3.87T - 259(y'_{\text{Fe}} - y'_{\text{Mn}})^{[27]}$ $L_{\text{Fe:C,Va}} = -34671^{[23]}$ $(\rightarrow)L_{\text{Mn:C,Va}} = -21388.6 + 23012(y''_{\text{C}} - y''_{\text{Va}})^{[5]}$ $L_{\text{Fe,Mn:C}} = -836.8$ $T_{\text{cFe:Va}} = -201, T_{\text{cMn:Va}} = -1620, \beta_{\text{Fe:Va}} = -2.1, \beta_{\text{Mn:Va}} = -1.86^{[27]}$ $T_{\text{cFe,Mn:Va}} = -2282 - 2068(y'_{\text{Fe}} - y'_{\text{Mn}})^{[27]}$
bcc_A2	(Fe,Mn) ₁ (C,Va) ₃	$G_{\text{Fe:Va}} = \text{GHSERFE}, G_{\text{Mn:Va}} = \text{GBCCMN}$ $G_{\text{Fe:C}} = \text{GHSERFE} + 3\text{GHSERCC} + 322054 + 75.67T^{[23]}$ $G_{\text{Mn:C}} = \text{GHSERMN} + 3\text{GHSERCC} + 10000 + 30T^{[30]}$ $L_{\text{Fe,Mn:Va}} = -2759 + 1.24T^{[27]}$ $L_{\text{Fe:C,Va}} = -1907T^{[23]}$ $T_{\text{cFe:Va}} = 1043, T_{\text{cMn:Va}} = -580, \beta_{\text{Fe:Va}} = 2.22, \beta_{\text{Mn:Va}} = -0.27^{[27]}$ $T_{\text{cFe,Mn:Va}} = 123^{[27]}$
cbcc	(Fe,Mn) ₁ (C,Va) ₁	$G_{\text{Fe:Va}} = \text{GHSERFE} + 4745^{[27]}, G_{\text{Mn:Va}} = \text{GHSERMN}$ $G_{\text{Fe:C}} = \text{GHSERFE} + \text{GHSERCC} + 50000$ $G_{\text{Mn:C}} = \text{GHSERMN} + \text{GHSERCC} + 5000 + 22.47T^{[30]}$ $L_{\text{Fe,Mn:Va}} = -10184^{[27]}$ $L_{\text{Fe:C,Va}} = -34671^{[18]}$ $L_{\text{Mn:C,Va}} = -50208^{[5]}$ $(\rightarrow)T_{\text{cMn:Va}} = -285, \beta_{\text{Mn:Va}} = -0.66^{[29]}$
cub	(Fe,Mn) ₁ (C,Va) ₁	$G_{\text{Fe:Va}} = \text{GHSERFE} + 3745^{[27]}, G_{\text{Mn:Va}} = \text{GCUBMN}$ $G_{\text{Fe:C}} = \text{GHSERFE} + \text{GHSERCC} + 90000^{[18]}$ $G_{\text{Mn:C}} = \text{GHSERMN} + \text{GHSERCC} + 2607^{[30]}$ $L_{\text{Fe,Mn:Va}} = -11518 + 2.82T^{[27]}$ $L_{\text{Fe:C,Va}} = -34671^{[18]}$ $L_{\text{Mn:C,Va}} = -10460^{[5]}$
hcp	(Fe,Mn) ₁ (C,Va) _{0.5}	$G_{\text{Fe:Va}} = \text{GHCPFE}, G_{\text{Mn:Va}} = \text{GHCPMN}^{[51]}$ $G_{\text{Fe:C}} = \text{GFCCFE} + 0.5\text{GHSERCC} + 48512.5 - 8.78T$ $G_{\text{Mn:C}} = \text{GHSERMN} + 0.5\text{GHSERCC} - 9000 - 1.07T^{[30]}$ $L_{\text{Fe,Mn:Va}} = -5748 + 3.87T + 273(y'_{\text{Fe}} - y'_{\text{Mn}})^{[20]}$ $L_{\text{Fe:C,Va}} = -17335^{[20]}$ $L_{\text{Mn:C,Va}} = -2092 - 3.14T - 5230(y''_{\text{C}} - y''_{\text{Va}})^{[5]}$ $L_{\text{Fe,Mn:C}} = 18828 - 47.36T - 33472(y'_{\text{Fe}} - y'_{\text{Mn}})$ $(\rightarrow)T_{\text{cMn:Va}} = -1620, \beta_{\text{Mn:Va}} = -1.86^{[27]}$
M ₃ C	(Fe,Mn) ₃ (C) ₁	$G_{\text{Fe:C}} = \text{GCEMFE}^{[25]}, G_{\text{Mn:C}} = 3\text{GHSERMN} + \text{GHSERCC} - 32000 - 4.1T^{[5]}$ $L_{\text{Fe,Mn:C}} = -3347.2 - 2510.4(y'_{\text{Fe}} - y'_{\text{Mn}})$ $(\rightarrow)T_{\text{cFe:C}} = 485, \beta_{\text{Fe:C}} = 1.008^{[25]}$
M ₅ C ₂	(Fe,Mn) ₅ (C) ₂	$G_{\text{Fe:C}} = \frac{5}{3}\text{GCEMFE} + \frac{1}{3}\text{GHSERCC} + 14100 - 7.35T$ $G_{\text{Mn:C}} = 5\text{GHSERMN} + 2\text{GHSERCC} - 62302 - 5T^{[5]}$ $L_{\text{Fe,Mn:C}} = -5020.8$
M ₇ C ₃	(Fe,Mn) ₇ (C) ₃	$G_{\text{Fe:C}} = \frac{7}{3}\text{GCEMFE} + \frac{2}{3}\text{GHSERCC} + 30000 - 15.45T$ $G_{\text{Mn:C}} = 7\text{GHSERMN} + 3\text{GHSERCC} - 91002 - 6.2T^{[5]}$ $L_{\text{Fe,Mn:C}} = -7893.53 + 6.46T$
M ₂₃ C ₆	(Fe,Mn) ₂₀ (Fe,Mn) ₃ (C) ₆	$G_{\text{Fe:Fe:C}} = \frac{23}{3}\text{GCEMFE} - \frac{5}{3}\text{GHSERCC} + 15000$ $G_{\text{Mn:Mn:C}} = 23\text{GHSERMN} + 6\text{GHSERCC} - 245501 - 2.44T^{[5]}$ $23G_{\text{Fe:Mn:C}} = 20G_{\text{Fe:Fe:C}} + 3G_{\text{Mn:Mn:C}}, 23G_{\text{Mn:Fe:C}} = 20G_{\text{Mn:Mn:C}} + 3G_{\text{Fe:Fe:C}}^{[20]}$ $L_{\text{Fe,Mn:Fe,Mn:C}} = -79496$

Table 4 Summary of model parameters in the Fe-Mn-Al system (J/mol)

Phase	Model	Parameter
Liquid	(Fe,Mn,Al)	$Z_{\text{FeFe}}^{\text{Fe}} = Z_{\text{MnMn}}^{\text{Mn}} = Z_{\text{AlAl}}^{\text{Al}} = Z_{\text{FeMn}}^{\text{Fe}} = Z_{\text{FeMn}}^{\text{Mn}} = Z_{\text{FeAl}}^{\text{Fe}} = Z_{\text{FeAl}}^{\text{Al}} = Z_{\text{AlMn}}^{\text{Al}} = Z_{\text{AlMn}}^{\text{Mn}} = 6$ $\Delta g_{\text{FeAl}} = -20292.4 + 3.35T + (-1673.6 - 1.26T)X_{\text{FeFe}} + (-10460 + 4.18T)X_{\text{AlAl}} - 1046X_{\text{FeFe}}^2$ [10] $\Delta g_{\text{FeMn}} = -1338.9 + 0.167T - 334.7X_{\text{MnMn}} + 418.4X_{\text{FeFe}}^2$ [9] $\Delta g_{\text{AlMn}} = -17572.8 + 6.07T + (-4602.4 + 1.26T)X_{\text{AlAl}}^2 + (-4184 + 1.67T)X_{\text{MnMn}}^2$ “Toop-like” interpolation (Al as the asymmetric component) [52]
fcc	(Fe,Mn,Al) ₁ (Va) ₁	$G_{\text{Fe:Va}} = \text{GFCCFE}, G_{\text{Mn:Va}} = \text{GFCCMN}, G_{\text{Al:Va}} = \text{GHSERAL}$ $L_{\text{Fe,Al:Va}} = -105855.20 + 30.65T + (29016.76 - 4.91T)(y'_{\text{Al}} - y'_{\text{Fe}}) + (32200 - 17T)(y'_{\text{Al}} - y'_{\text{Fe}})^2$ [10] $L_{\text{Fe,Mn:Va}} = -7762 + 3.87T - 259(y'_{\text{Fe}} - y'_{\text{Mn}})^2$ [27] $L_{\text{Al,Mn:Va}} = -69938 + 27.18T + 8248.9(y'_{\text{Al}} - y'_{\text{Mn}})^2$ [38] $L_{\text{Fe,Al,Mn:Va}} = -25104 y'_{\text{Mn}}$ $T_{\text{cFe:Va}} = -201, T_{\text{cMn:Va}} = -1620, \beta_{\text{Fe:Va}} = -2.1, \beta_{\text{Mn:Va}} = -1.86$ [27] $T_{\text{cFe,Mn:Va}} = -2282 - 2068(y'_{\text{Fe}} - y'_{\text{Mn}})^2$ [27]
bcc_A2	(Fe,Mn,Al) ₁ (Va) ₃	$G_{\text{Fe:Va}} = \text{GHSERFE}, G_{\text{Mn:Va}} = \text{GBCCMN}, G_{\text{Al:Va}} = \text{GBCCAL}$ $L_{\text{Fe,Al:Va}} = -123044 + 32T + 2945.20(y'_{\text{Al}} - y'_{\text{Fe}}) - 3347.20(y'_{\text{Al}} - y'_{\text{Fe}})^2$ [10] $L_{\text{Fe,Mn:Va}} = -2759 + 1.24T$ [27] $L_{\text{Al,Mn:Va}} = -111336.2 + 44.48T + (-68691.8 + 44.53T)(y'_{\text{Al}} - y'_{\text{Mn}})^2$ [38] $L_{\text{Fe,Al,Mn:Va}} = 4184$ $T_{\text{cFe:Va}} = 1043, T_{\text{cMn:Va}} = -580, \beta_{\text{Fe:Va}} = 2.22, \beta_{\text{Mn:Va}} = -0.27$ [27] $T_{\text{cFe,Mn:Va}} = 123$ [27] $T_{\text{cFe,Al:Va}} = -438 + 1720(y'_{\text{Fe}} - y'_{\text{Al}})^2$ [32]
bcc_B2	(Fe,Mn,Al) _{0.5} (Fe,Mn,Al) _{0.5} (Va) ₃	$G_{\text{Fe:Fe:Va}} = G_{\text{Al:Al:Va}} = G_{\text{Mn:Mn:Va}} = G_{\text{Fe:Mn:Va}} = G_{\text{Mn:Fe:Va}} = 0$ $(\rightarrow) G_{\text{Fe:Al:Va}} = G_{\text{Al:Fe:Va}} = -16092 - 2.95T$ [10] $G_{\text{Al:Mn:Va}} = G_{\text{Mn:Al:Va}} = -10250$ $T_{\text{cFe:Al:Va}} = T_{\text{cAl:Fe:Va}} = -250$ [32] $\beta_{\text{Fe:Al:Va}} = \beta_{\text{Al:Fe:Va}} = -2.72$ [32] $(\rightarrow) L_{\text{Fe,Al:Al:Va}} = 1665.37 - 4T - 524(y'_{\text{Al}} - y'_{\text{Fe}}) - 1560(y'_{\text{Al}} - y'_{\text{Fe}})^2$ [32] $(\rightarrow) L_{\text{Al:Fe,Al:Va}} = 1665.37 - 4T - 524(y''_{\text{Al}} - y''_{\text{Fe}}) - 1560(y''_{\text{Al}} - y''_{\text{Fe}})^2$ [32] $(\rightarrow) L_{\text{Fe,Al:Fe:Va}} = -5346 - 1.6T - 524(y'_{\text{Al}} - y'_{\text{Fe}}) - 1560(y'_{\text{Al}} - y'_{\text{Fe}})^2$ [32] $(\rightarrow) L_{\text{Fe:Fe,Al:Va}} = -5346 - 1.6T - 524(y''_{\text{Al}} - y''_{\text{Fe}}) - 1560(y''_{\text{Al}} - y''_{\text{Fe}})^2$ [32] $T_{\text{cFe,Al:Al:Va}} = T_{\text{cFe,Al:Fe:Va}} = T_{\text{cFe:Fe,Al:Va}} = T_{\text{cAl:Fe,Al:Va}} = 250$ [32] $\beta_{\text{Fe,Al:Al:Va}} = \beta_{\text{Fe,Al:Fe:Va}} = -0.6 - 1.6(y'_{\text{Al}} - y'_{\text{Fe}}) + 0.4(y'_{\text{Al}} - y'_{\text{Fe}})^2$ [32] $\beta_{\text{Fe:Fe,Al:Va}} = \beta_{\text{Al:Fe,Al:Va}} = -0.6 - 1.6(y''_{\text{Al}} - y''_{\text{Fe}}) + 0.4(y''_{\text{Al}} - y''_{\text{Fe}})^2$ [32] $L_{\text{Fe,Al:Fe,Al:Va}} = -8400 - 1.8T$ [10] $L_{\text{Fe,Al:Mn:Va}} = L_{\text{Mn:Fe,Al:Va}} = -4184$ $G_{\text{Fe:Va}} = \text{GHSERFE} + 4745$ [27] $G_{\text{Mn:Va}} = \text{GHSERMN}, G_{\text{Al:Va}} = \text{GCBCCAL}$ $L_{\text{Fe,Mn:Va}} = -10184$ [27] $L_{\text{Al,Mn:Va}} = -63000 + 21T$ [38] $(\rightarrow) T_{\text{cMn:Va}} = -285, \beta_{\text{Mn:Va}} = -0.66$ [29]
cbcc	(Fe,Mn,Al) ₁ (Va) ₁	$G_{\text{Fe:Va}} = \text{GHSERFE} + 3745$ [27] $G_{\text{Mn:Va}} = \text{GCUBMN}, G_{\text{Al:Va}} = \text{GCUBAL}$ $L_{\text{Fe,Al:Va}} = -129704 + 41.84T$ [10] $L_{\text{Fe,Mn:Va}} = -11518 + 2.82T$ [27] $L_{\text{Al,Mn:Va}} = -118512 + 52.74T - 3174.9(y'_{\text{Al}} - y'_{\text{Mn}})^2$ [38] $L_{\text{Fe,Mn:Al:Va}} = -46024y'_{\text{Fe}} + (-30815.2 - 20.92T)y'_{\text{Al}}$
hcp	(Fe,Mn,Al) ₁ (Va) _{0.5}	$G_{\text{Fe:Va}} = \text{GHCPFE}, G_{\text{Mn:Va}} = \text{GHCPMN}, G_{\text{Al:Va}} = \text{GHCPAL}$ $L_{\text{Fe,Al:Va}} = -40000$ [21] $L_{\text{Fe,Mn:Va}} = -5748 + 3.87T + 273(y'_{\text{Fe}} - y'_{\text{Mn}})^2$ [20] $(\rightarrow) L_{\text{Al,Mn:Va}} = -95264.1 + 33.10T + (-56880.6 + 43.14T)(y'_{\text{Al}} - y'_{\text{Mn}}) + 14430.2(y'_{\text{Al}} - y'_{\text{Mn}})^2$ [38] $(\rightarrow) T_{\text{cMn:Va}} = -1620, \beta_{\text{Mn:Va}} = -1.86$ [27]
Al ₈ Fe ₅	(Al,Fe) ₈ (Al,Fe) ₅	$G_{\text{Al:Al}} = 13\text{GBCCAL}$ [32] $G_{\text{Fe:Fe}} = 13\text{GHSERFE} + 13000$ [32] $G_{\text{Al:Fe}} = 8\text{GBCCAL} + 5\text{GHSERFE} - 384500 + 307T$ [10] $G_{\text{Fe:Al}} = 8\text{GHSERFE} + 5\text{GBCCAL} + 200000 + 307T$ [10] $L_{\text{Al:Al,Fe}} = -133888$ [10] $L_{\text{Al,Fe:Fe}} = -174000$ [32]
Al ₁₃ Fe ₄	(Al) ₃₂ (Fe) ₁₂ (Al,Va) ₇	$G_{\text{Al:Fe:Al}} = 39\text{GHSERAL} + 12\text{GHSERFE} - 1564680 + 3777T$ [32] $G_{\text{Al:Fe:Va}} = 32\text{GHSERAL} + 12\text{GHSERFE} - 1433100 + 3777T$ [32]
Al ₈ Mn ₅	Al ₁₂ Mn ₅ (Al,Mn) ₉	$G_{\text{Al:Mn:Al}} = 21\text{GHSERAL} + 5\text{GHSERMN} - 199851.6 - 60.66T$ [38]

Table 4 continued

Phase	Model	Parameter
HTAl ₁₁ Mn ₄	(Al,Mn) ₂₉ Mn ₁₀	$G_{\text{Al:Mn:Mn}} = 12\text{GHSERAL} + 14\text{GHSERMN} - 791382.8 + 289.48T^{[38]}$ $L_{\text{Al:Mn:Al,Mn}} = -522189.2 + 244.35T + 38014.6(y_{\text{Al}}''' - y_{\text{Mn}}''')^{[38]}$ $G_{\text{Al:Mn}} = 29\text{GHSERAL} + 10\text{GHSERMN} - 744942.9 + 130.36T^{[38]}$ $G_{\text{Mn:Mn}} = 39\text{GHSERMN} + 195000^{[38]}$ $L_{\text{Al,Mn:Mn}} = -664033.5^{[38]}$
Al ₂ Fe		$G = 2\text{GHSERAL} + \text{GHSEFFE} - 94850 + 13.42T^{[32]}$
Al ₅ Fe ₂		$G = 5\text{GHSERAL} + 2\text{GHSEFFE} - 217301 + 34.83T^{[32]}$
LTA ₁₁ Mn ₄		$G = 11\text{GHSERAL} + 4\text{GHSERMN} - 350550 + 97.90T^{[38]}$
λ-Al ₄ Mn	(→)Al ₉₉ Mn ₂₃ *	$G = 99\text{GHSERAL} + 23\text{GHSERMN} - 2506648.6 + 835.55T$
(Al ₄₆₁ Mn ₁₀₇) ^[38]		
μ-Al ₄ Mn		$G = 4\text{GHSERAL} + \text{GHSERMN} - 109088.5 + 36.67T^{[38]}$
Al ₆ Mn		$G = 6\text{GHSERAL} + \text{GHSERMN} - 109090.8 + 35.22T^{[38]}$
Al ₁₂ Mn		$G = 12\text{GHSERAL} + \text{GHSERMN} - 110389.5 + 36.80T^{[38]}$

*Du et al.^[38] modeled this phase as “Al₄₆₁Mn₁₀₇”, but it was treated as “Al₉₉Mn₂₃” in the present study. The Gibbs energy of formation of this phase was then fitted to that of Du et al.^[38]