

# Fe-Zr (Iron-Zirconium)

H. Okamoto

The Fe-Zr phase diagram in [Massalski2] was updated by [1993Oka]. [1997Oka] showed the Fe-Zr phase diagram calculated by [1993Pel] and pointed out that the diagram may need further improvement because new experimental phase boundary data reported in [1993Oka] were not taken into account. Since then, [2001Jia] reported another calculated phase diagram (Fig. 1). Because of the controversy in

earlier reports, [2002Ste] reexamined the Fe-Zr phase diagram by differential thermal analysis, electron probe microanalysis, x-ray diffraction, and metallography. The result is shown in Fig. 2. The most significant difference from all the other diagrams quoted above is the absence of  $\beta\text{Fe}_2\text{Zr}$  and the presence of  $\text{Fe}_{23}\text{Zr}_6$ . Thermodynamic modeling should be attempted with inclusion of this new result.

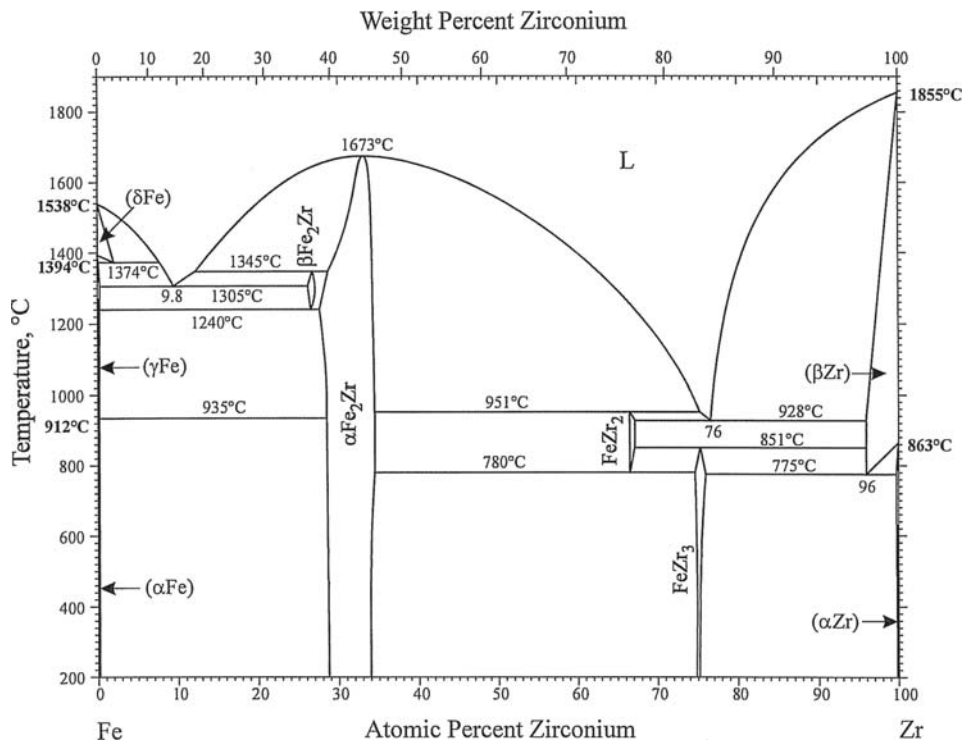
Fe-Zr crystal structure data are given in Table 1.

**Table 1** Fe-Zr crystal structure data

Phase	Composition, at.% Zr	Pearson symbol	Space group	Strukturbericht designation	Prototype
( $\delta\text{Fe}$ )	0-2	<i>cI2</i>	<i>Im</i> $\bar{3}m$	A2	W
( $\gamma\text{Fe}$ )	0-0.5	<i>cF4</i>	<i>Fm</i> $\bar{3}m$	A1	Cu
( $\alpha\text{Fe}$ )	0	<i>cI2</i>	<i>Im</i> $\bar{3}m$	A2	W
$\beta\text{Fe}_2\text{Zr}$	26.5-27	<i>hP24</i>	<i>P6</i> $_3$ / <i>mmc</i>	C36	$\text{MgNi}_2$
$\alpha\text{Fe}_2\text{Zr}$	28-34.5	<i>cF24</i>	<i>Fd</i> $\bar{3}m$	C15	$\text{Cu}_2\text{Mg}$
$\text{FeZr}_2$	66.7-67.2	<i>tI12</i>	<i>I4/mcm</i>	C16	$\text{Al}_2\text{Cu}$
$\text{FeZr}_3$	74.8-75.4	<i>oC16</i>	<i>Cmcm</i>	<i>E1</i> <sub>a</sub>	$\text{BRe}_3$
( $\beta\text{Zr}$ )	96-100	<i>cI2</i>	<i>Im</i> $\bar{3}m$	A2	W
( $\alpha\text{Zr}$ )	100	<i>hP2</i>	<i>P6</i> $_3$ / <i>mmc</i>	A3	Mg

## References

- 1993Oka:** H. Okamoto, Fe-Zr (Iron-Zirconium), *J. Phase Equilibria*, **14**(5), 1993, p 652-653
- 1993Pel:** A.D. Pelton, L. Leibowitz, and R.A. Blomquist, Thermodynamic Analysis of Phase Equilibria in the Iron-Zirconium System, *J. Nucl. Mater.*, **201**, 1993, p 218-224
- 1997Oka:** H. Okamoto, Fe-Zr (Iron-Zirconium), *J. Phase Equilibria*, **18**(3), 1997, p 316
- 2001Jia:** M. Jiang, K. Oikawa, T. Ikeshoji, L. Wulff, and K. Ishida, Thermodynamic Calculations of Fe-Zr and Fe-Zr-C Systems, *J. Phase Equilibria*, **22**(4), 2001, p 406-417
- 2002Ste:** F. Stein, G. Sauthoff, and M. Palm, Experimental Determination of Intermetallic Phases, Phase Equilibria, and Invariant Reaction Temperatures in the Fe-Zr System, *J. Phase Equilibria*, **23**(6), 2002, p 480-494



**Fig. 1** Fe-Zr phase diagram calculated by [2001Jia]

### Section III: Supplemental Literature Review

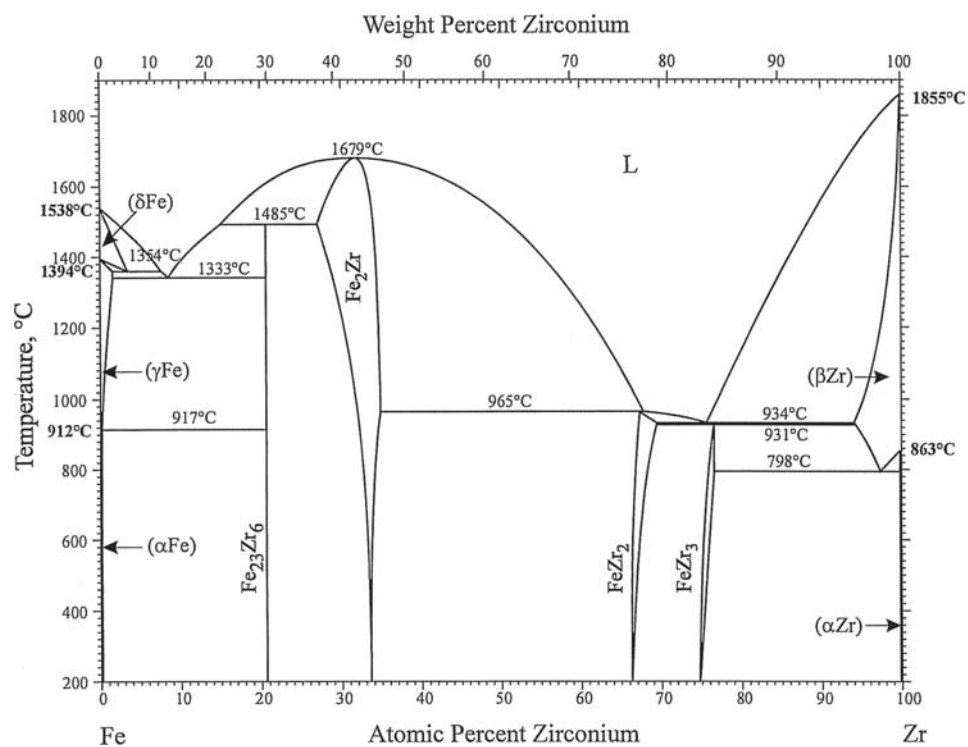


Fig. 2 Fe-Zr phase diagram experimentally determined by [2002Ste]