

Corrigendum

Corrigendum to “Synchrotron tomographic quantification of the influence of Zn concentration on dendritic growth in Mg-Zn alloys” [Acta Mater. 156 (2018) 287–296]

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In solidification science, the solid-liquid interfacial area density is a key metric that characterizes the overall semi-solid morphology in a general sense. This interfacial area density can be defined in two different ways. The first is the specific interface area S_s , which is defined as the area of the solid-liquid interface A divided by the volume of the enclosed solid volume V_s , i.e. $S_s = \frac{A}{V_s}$. As noted by Neumann-Heyme, Eckert, and Beckermann [1], the inverse of the specific interface area can be considered a characteristic length scale of the microstructure. An alternative measure is the interfacial area concentration S_V , in which the solid-liquid interface A is divided by the sample volume V that includes both the solid and liquid phases, i.e. $S_V = \frac{A}{V}$. The two measures of interfacial area density are related as $S_V = g_s S_s$ where g_s is the volume fraction of the solid phase.

The authors regret that in their recent paper [2], the terms S_s and S_V were not clearly defined, which resulted in an incorrect use of the Cahn [3] and Rath [4] equation, (Equation (3) in Ref. [2]), to generate Figure 10 of the original manuscript.

The revised figure is shown below as Fig. 1. This figure compares the experimentally measured variation in S_V with the prediction given by Eq (3) in Ref. [2], assuming that $m = n$ and that K and m are fitting parameters. As can be seen, the model curves are able to match the experimental data. An important outcome is that now the exponent m has a positive value between 0 and 1, matching other studies in this field. In the original manuscript, the exponent m had a negative value. This new figure shows clearly the globular structure of the Mg-25 wt.%Zn solid, having smaller S_V , while that the hyper-branched structure seen at Mg-38 wt.%Zn and the dendritic structure with branched arms at Mg-50 wt.%Zn have a very similar morphological evolution, in a general sense.

The error highlighted above did not only occur in Ref. [2], but also in one other of our manuscripts. Fig. 2 is a corrected version of Figure 8b of [5] where we have again assumed that the exponents m and n are equivalent. Again, a much better fit to the data is achieved.

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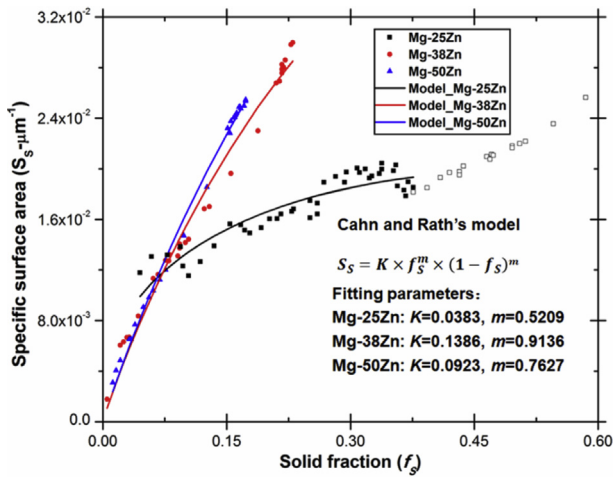


Fig. 1. Interfacial area concentration evolution as a function of solid fraction, and fitted curves using modified Rath and Cahn's model. (Note, change from filled to hollow symbols denotes an increased cooling rate near the end of the experiment; hollow data was not used for fitting).

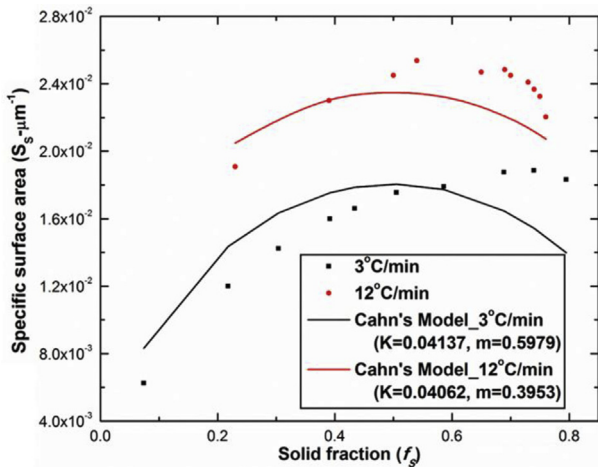


Fig. 2. Interfacial area concentration as function of solid fraction, normalized by total volume, and compared to Cahn's model.

References

- [1] H. Neumann-Heyme, K. Eckert, C. Beckermann, General evolution equation for the specific interface area of dendrites during alloy solidification, *Acta Mater.* 140 (2017) 87–96, <https://doi.org/10.1016/j.actamat.2017.08.021>.
- [2] S. Shuai, E. Guo, J. Wang, A.B. Phillion, T. Jing, Z. Ren, P.D. Lee, Synchrotron tomographic quantification of the influence of Zn concentration on dendritic growth in Mg-Zn alloys, *Acta Mater.* 156 (2018) 287–296, <https://doi.org/10.1016/j.actamat.2018.06.026>.
- [3] J.W. Cahn, Significance of average mean curvature and its determination by quantitative metallography, *Trans. Metall. Soc. AIME.* 239 (1967) 610–616.
- [4] B. Rath, Solid-state phase transformations, in: H. Aaronson, D. Laughlin, R. Sekerka, C. Wayman (Eds.), *Solid-state Phase Transform.* 1982, pp. 1097–1103.
- [5] S. Shuai, E. Guo, A.B. Phillion, M.D. Callaghan, T. Jing, P.D. Lee, Fast synchrotron X-ray tomographic quantification of dendrite evolution during the solidification of Mg-Sn alloys, *Acta Mater.* 118 (2016) 260–269, <https://doi.org/10.1016/j.actamat.2016.07.047>.