Supporting Information

Study of the Freeze Casting Process by Artificial Neural Networks

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Table S1. Fitting parameters corresponding to Figures 2 and 3. N is the number of samples in the group. r and R^2 are the coefficients of correlation and determination, respectively. For all r and R^2 in this table, $p < 0.0001$. MAE is mean absolute error; MAPE is mean absolute percentage error. KS D-value and p-value are obtained from Kolmogorov-Smirnov test.

group name	N	r	R^2	MAE	MAPE (%)	KS D-value	KS p-value
ALL	625	0.82	0.67	0.0725	15.78	0.40	2.70E-91
water	457	0.82	0.67	0.0719	14.69	0.41	1.91E-68
camphene	71	0.80	0.64	0.0832	18.49	0.40	1.25E-10
TBA	97	0.81	0.65	0.0674	18.96	0.43	3.72E-17
ceramic	532	0.77	0.59	0.0770	17.15	0.40	1.48E-76
metal	38	0.75	0.51	0.0757	14.54	0.45	2.01E-07
polymer	55	0.94	0.82	0.0267	3.37	0.45	7.18E-11

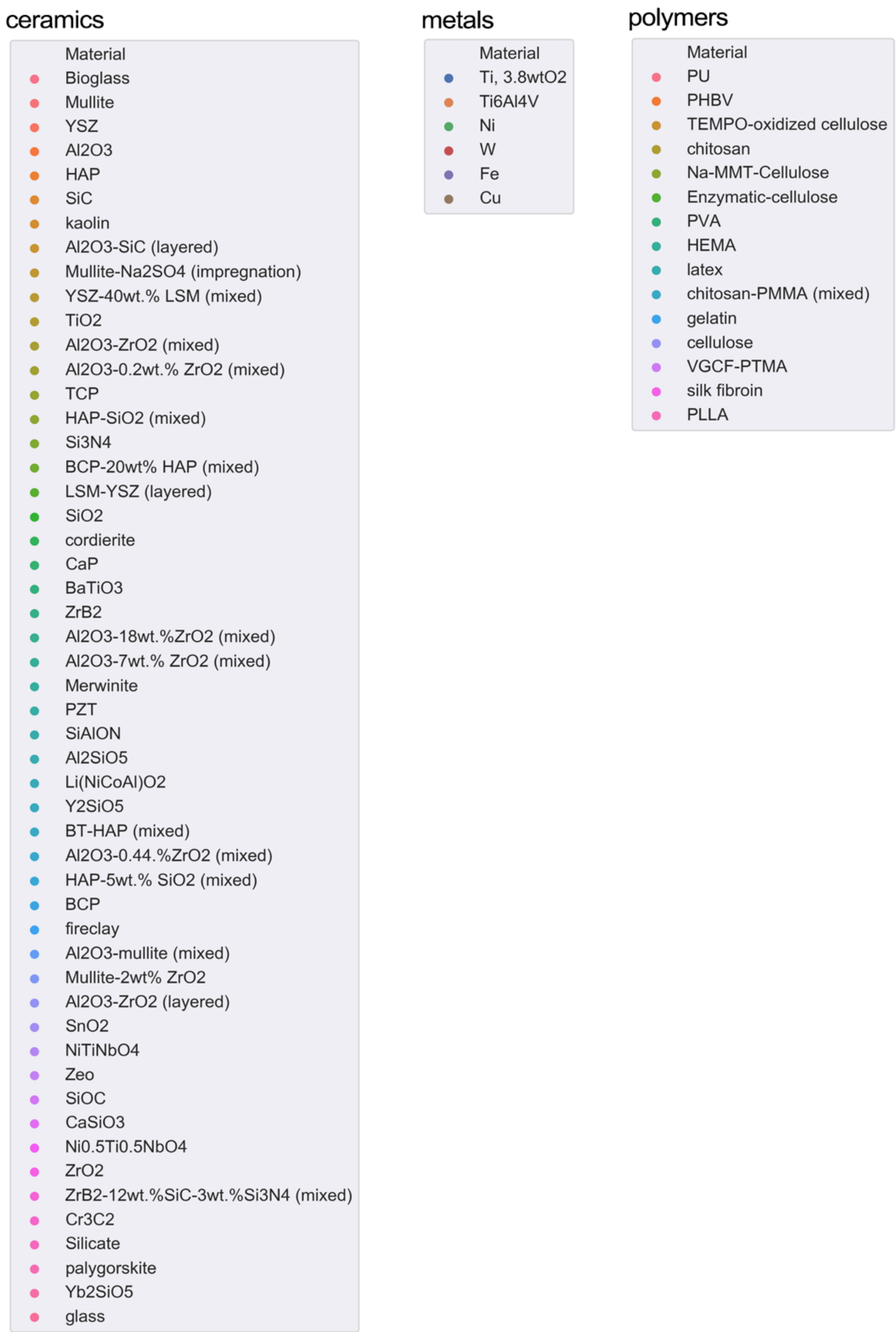

Figure S1. Legends of Figure 3c.

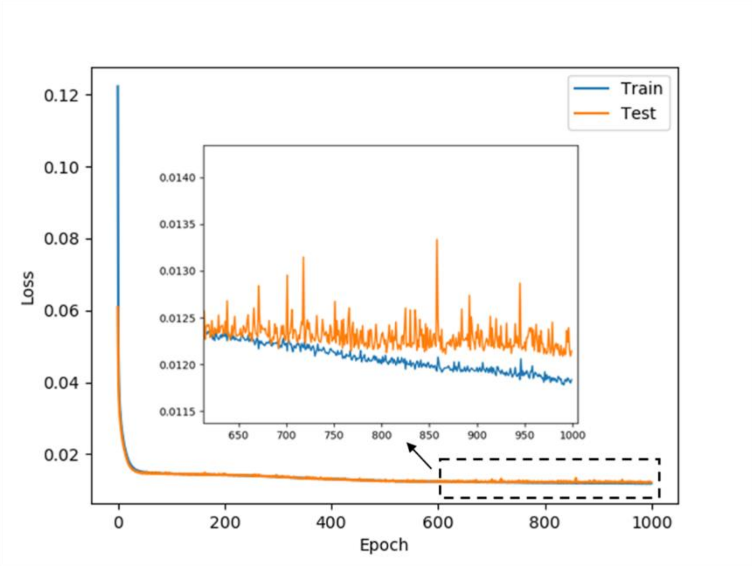

Figure S2. Loss decrease during ANN model training.

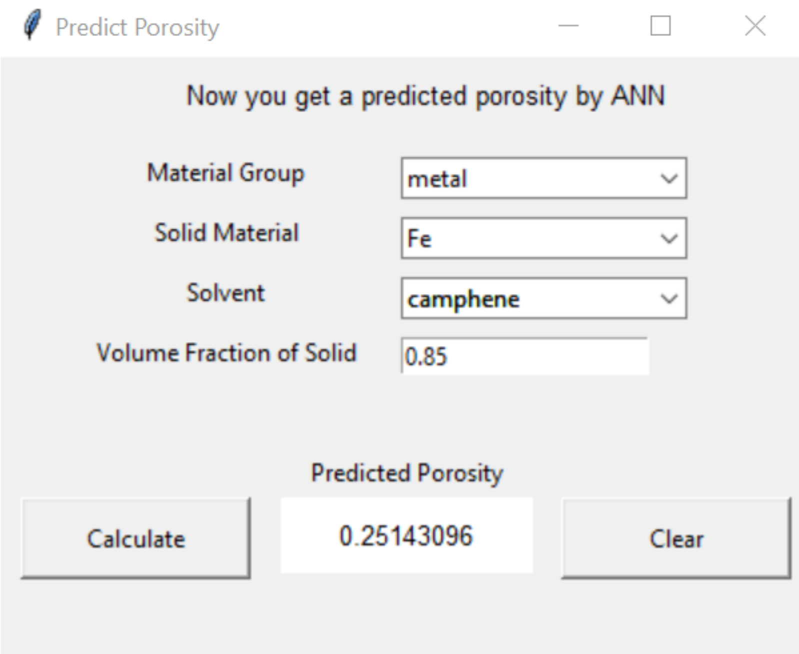

Figure S3. The interface of the ANN-prediction tool.

Loss functions:

$$\mathrm{MSE} = \frac{1}{n}\sum_{j=1}^{n}(y_j - \hat{y}_j)^2, \tag{S1}$$

$$\mathrm{MAE} = \frac{1}{n}\sum_{j=1}^{n}\left|y_j - \hat{y}_j\right|, \tag{S2}$$

$$\mathrm{MAPE} = \frac{100\%}{n}\sum_{j=1}^{n}\left|\frac{y_j - \hat{y}_j}{y_j}\right|, \tag{S3}$$

$$\mathrm{RMSE} = \sqrt{\frac{1}{n}\sum_{j=1}^{n}(y_j - \hat{y}_j)^2}, \tag{S4}$$

where y is the observed value and $\hat{y}$ is the predicted value, n is the total number of the samples in a set.