Supplementary Material

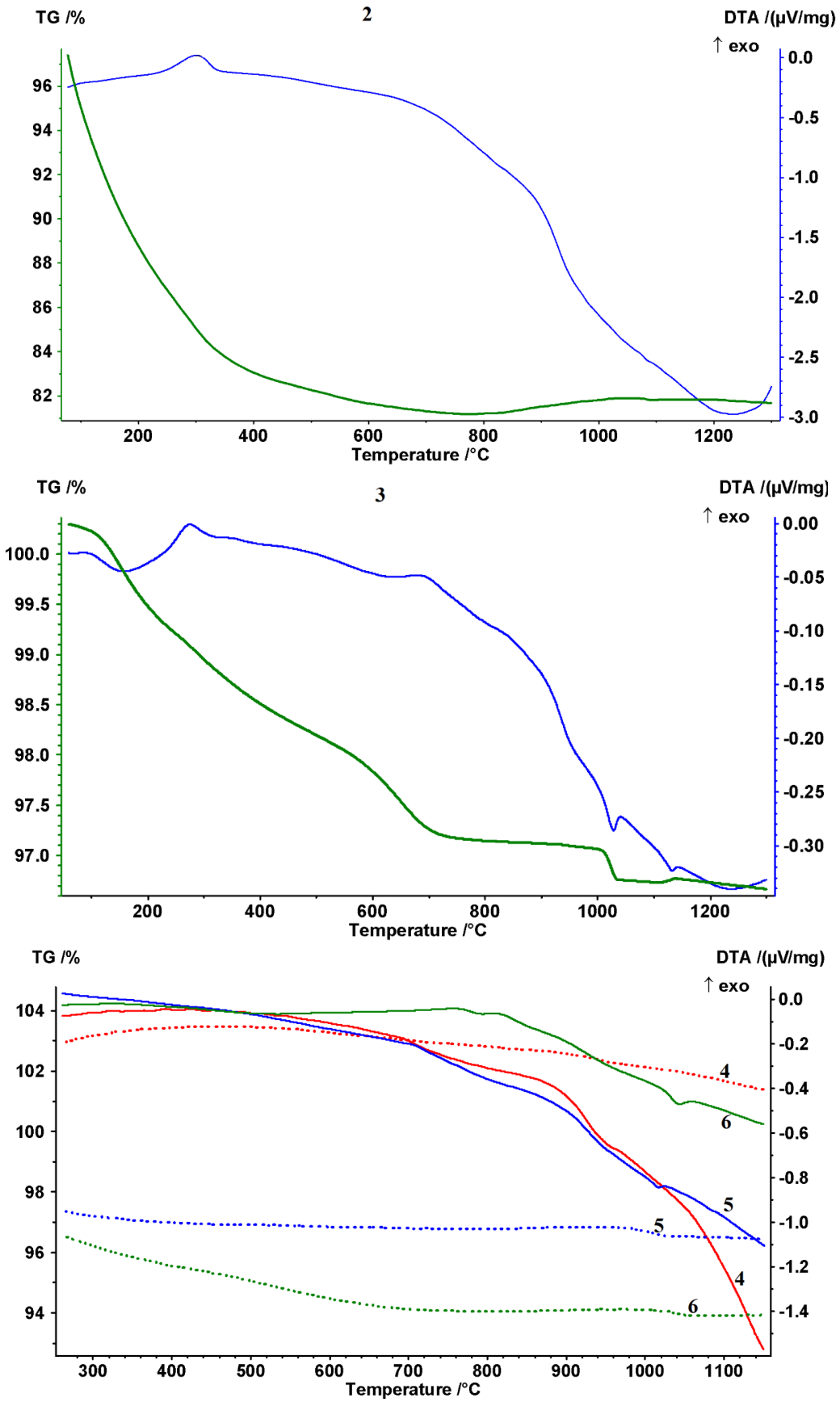


Fig. S1. (Color online) TG-DTA curves of samples.

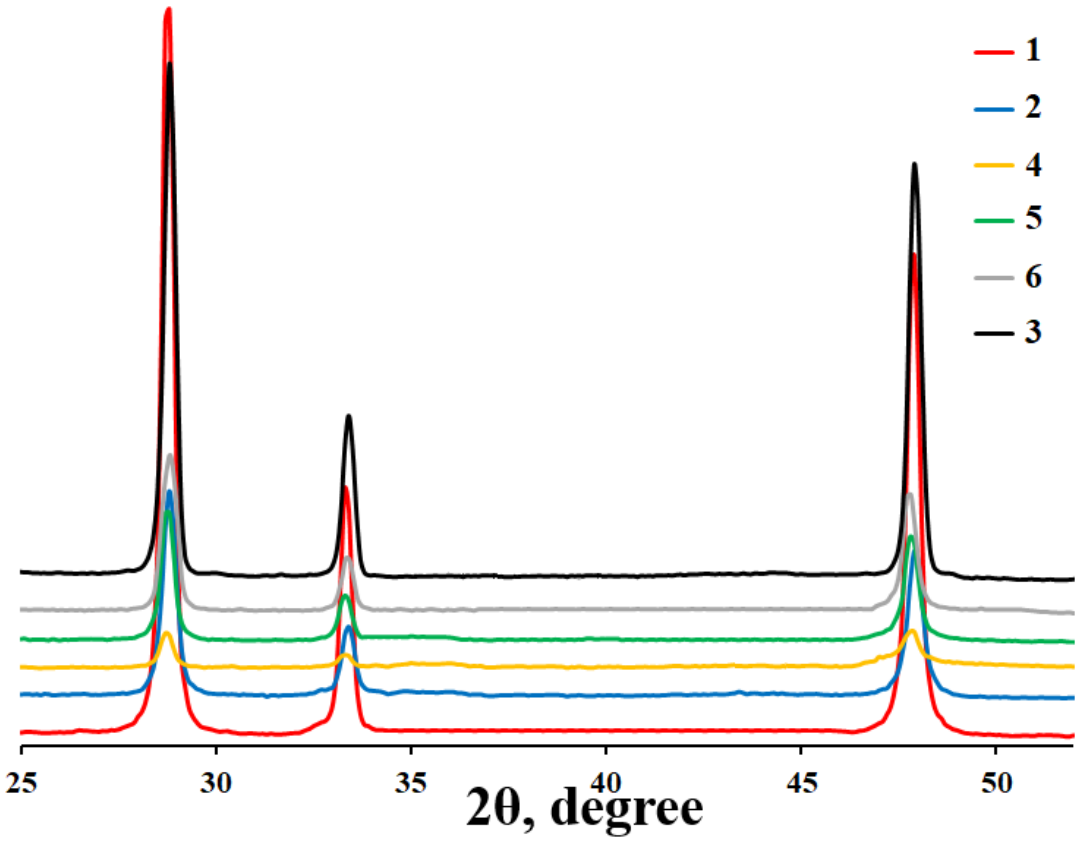


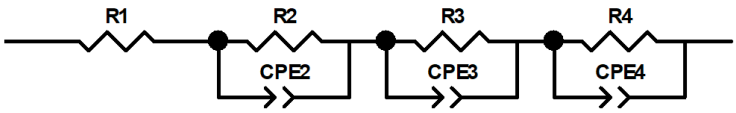
Fig. S2. (Color online) XRD patterns of sintered ceramics at 1000°C.

Complex impedance spectra

Equivalent Circuits fitting provides error estimates for each variable, as well as the general goodness of fit values.

The Chi-Squared value is the square of the standard deviation between the original data and the calculated spectrum. This is often a poor measurement of the goodness of fit. As an example, let's examine only 2 points from the spectrum — assuming that the impedance was 2 Ohms at high frequencies and 1000 Ohms at high frequencies. If there was an error of 1 Ohm in the fit of both points, the 1000 Ohm point would be a very good fit (0.1%), but the 2 Ohm point would have a 50% error. This would actually produce a much smaller Chi-Squared value than if both points had a 1% error (10 Ohms error in the 1000 Ohm point and 0.02 Ohm error in the 2 Ohm value).

An alternate goodness of fit value is the Weighted Sum of Squares. Depending on the Weighting Type parameter, the Sum of Squares is proportional to the average percentage error between the original data points and the calculated values. This is particularly useful when comparing the goodness of fit of two different models basing on a single data set.



Element	Freedom	Value	Error	Error %
R1	Free(+)	28.32	0.90815	3.2067
R2	Free(+)	30.97	3.5348	11.414
CPE2-T	Free(+)	2.2571E-08	2.5033E-09	11.091
CPE2-P	Fixed(X)	1	N/A	N/A
R3	Free(+)	40.15	9.9857	24.871
CPE3-T	Free(+)	9.9631E-06	8.2315E-06	82.62
CPE3-P	Free(+)	0.67118	0.094739	14.115
R4	Free(+)	250.3	27.207	10.87
CPE4-T	Free(+)	0.0023512	0.00016383	6.9679
CPE4-P	Free(+)	0.32023	0.032397	10.117

Chi-Squared:	0.0013989
Weighted Sum of Squares:	0.090928

Fig. S3. The evidence of the adequacy of the selected models and the accuracy of the modeling for ceramics 3.