

Supplementary material

Typical spectra collected from the surface of 0GAIN and 5GAIN composites are shown in Figure S1. Only signal from the free carbon is seen in spectra of both samples (black graphs in Figure 4). Polishing results in the signals from YSZ matrix in the spectra. The signals from graphene or any carbon phase are not seen. Latter points on the lack of GAIN in the near-edge layer. The only exception is the GAIN5 composite with 5 wt.% GAIN addition. For the composite with the highest GAIN content the spectrum collected from the surface after polishing is equal to the one collected from the cross-section.

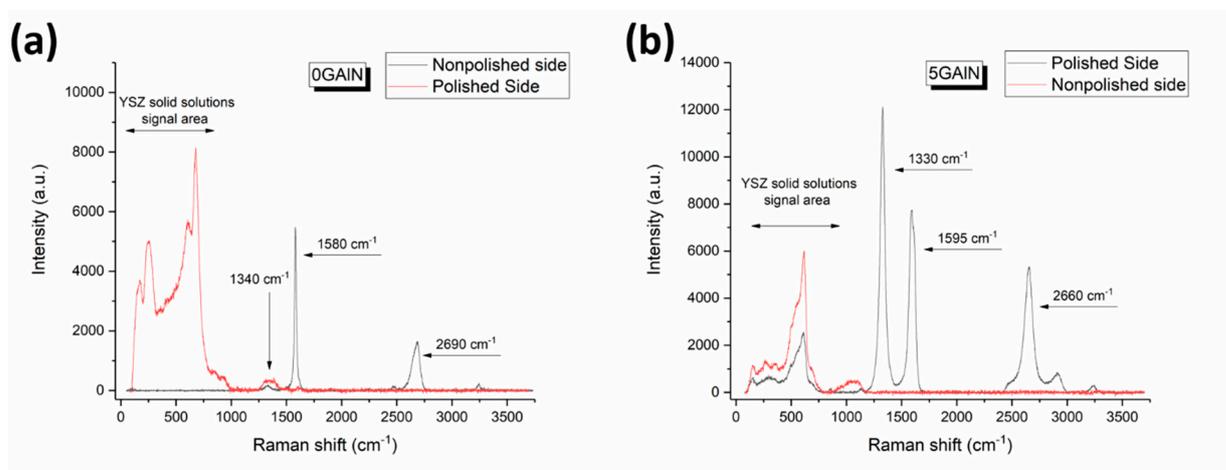


Figure S1. Raman spectra collected from the both polished and non-polished surface of the samples (a) 0GAIN and (b) 5GAIN.

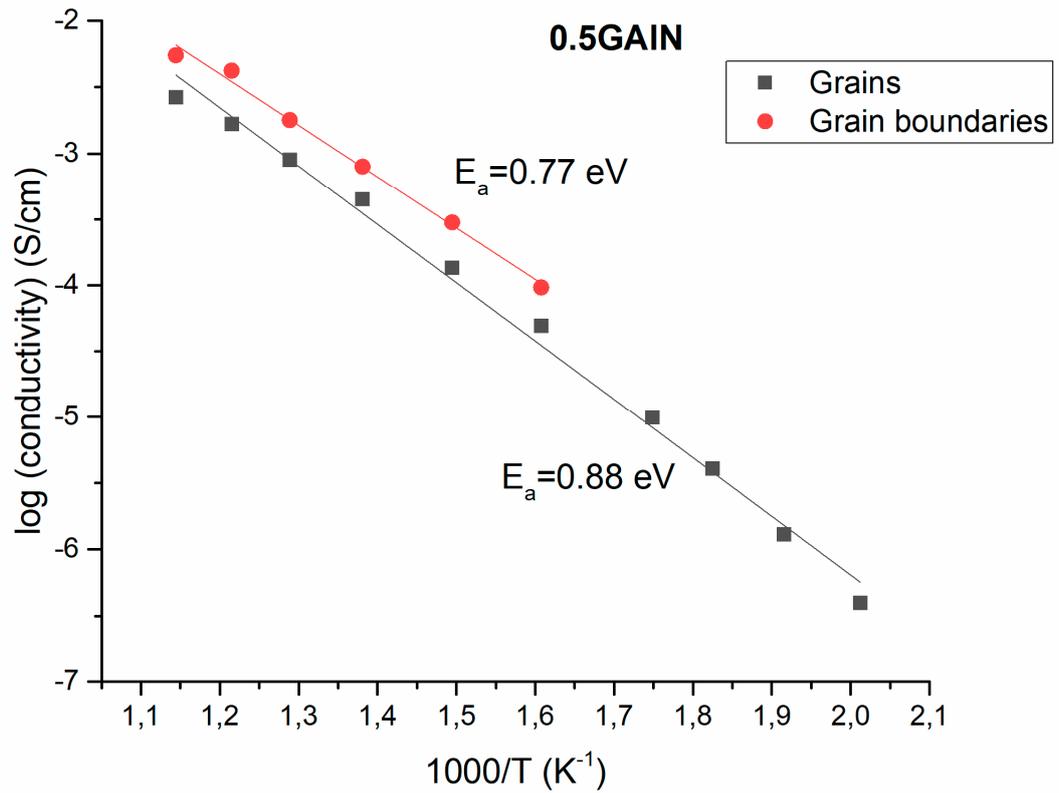


Figure S2. The Arrhenius plots for grain and grain boundary components of conductivity in 0.5GAIN composite.

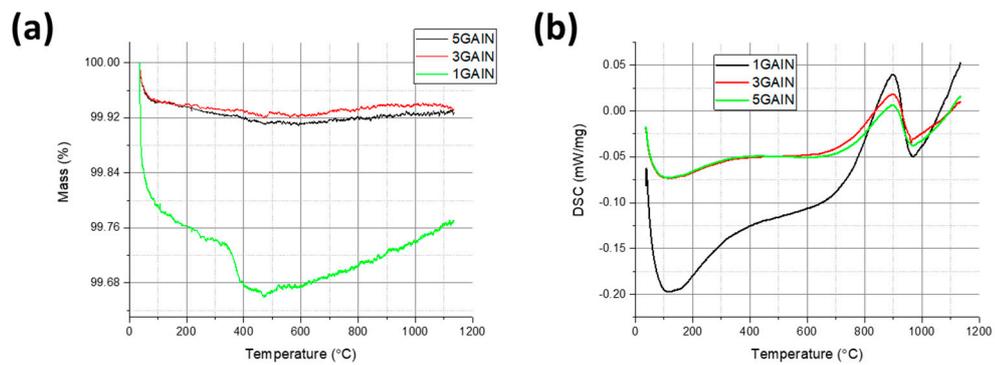


Figure S3. (a) Thermogravimetric analysis and (b) differential scanning calorimetry results for ceramics 1GAIN-3GAIN.