**Supporting Information for:**

**Direct measurements of quasi-Zero Grain Boundary Energies in Ceramics**

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**Supplemental Figures**

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**Figure 1S.** X-ray diffraction patterns for dense pellets of nanocrystalline Gd doped YSZ annealed at 1100 °C for different times to achieve different grain sizes. Sizes for respective patterns are indicated in the legend.

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**Figure 2S.** Grain size distribution (normalized) for the Gd-doped YSZ samples after the DSC experiments. Normal distribution is observed for all initial sizes, indicating no abnormal grain growth.

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**Figure 3S.** X-ray diffraction patterns for dense pellets of nanocrystalline Gd doped YSZ taken after the DSC experiment. The induced grain growth caused overall peak sharpening. The legend indicates the initial grain sizes, not the sizes after the DSC runs. Those are listed in Table S1.

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**Figure 4S:** X-ray diffraction pattern for 4 mol% Gd YSZ annealed at 1300°C grain growth for 16 h.

**Table 1S**. Experimental evidence of zero grain boundary energy of 4Gd\_8YSZ

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Grain Size (nm) | Annealing at 1100 °C | Grain Size after DSC (nm) | ΔGBA (m2/g) |
| 13 ± 0.3 | - | 307 ± 6 | 43.36 ± 1.02 |
| 18.1 ± 0.7 | 10 min | 292 ± 6 | 30.67 ± 1.21 |
| 20.7 ± 0.8 | 30 min | 312 ± 4 | 26.04 ± 1.06 |
| 25.0 ± 0.9 | 2 h | 231 ± 4 | 21.14 ± 0.82 |
| 28.1 ± 0.7 | 4 h | 252 ± 4 | 18.53 ± 0.51 |
| 32.2 ± 0.8 | 8 h | 306 ± 4 | 16.45 ± 0.44 |
| 38.7 ± 0.9 | 16 h | 308 ± 4 | 13.37 ± 0.35 |
| 43.5 ± 0.6 | 24 h | 267 ± 6 | 11.55 ± 0.18 |