

1. Rietveld analysis of alumina/EG composites

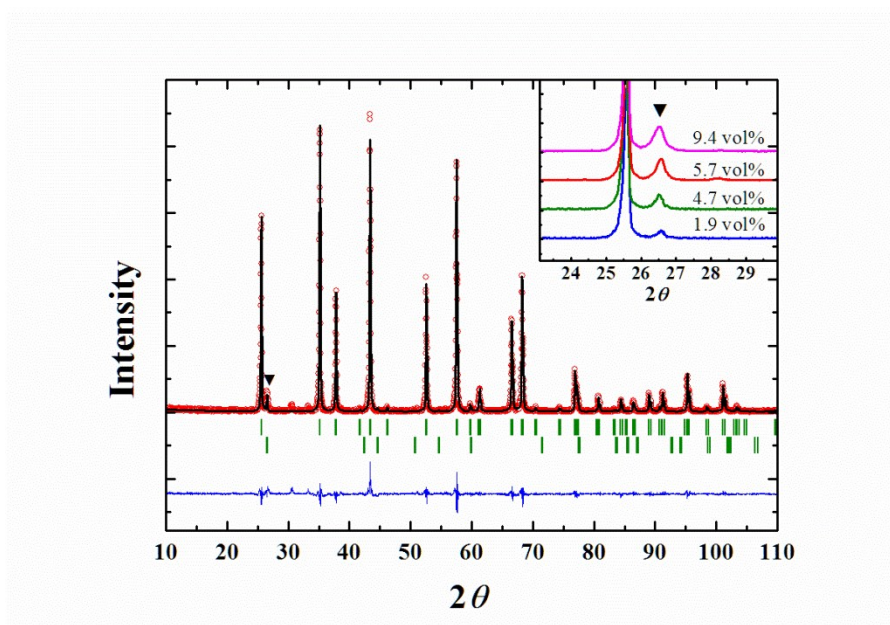


Fig. S1. Rietveld refinement of powder XRD profiles of the sintered 4.7 vol% EG/Al₂O₃ composite by a hot press at 1500 °C for 1 h with a pressure of 20 MPa. Measured data, fitted results, and the difference between measured and fitted results are expressed as red open circles, black solid lines, green vertical lines, and blue solid lines, respectively. The Bragg positions for corundum (Al₂O₃) phase and graphite (C) phase are represented by upper and lower vertical lines, respectively. The inset shows a detail of the XRD diffraction patterns in the 2θ range 23° to 30° for the EG/Al₂O₃ composites with different amount of carbon. The ▼ marker indicates the (002) peak of graphite phase.

Crystalline phases of the sintered composites were identified by Rietveld refinement of powder X-ray diffraction data. As shown in Fig. S1, the sintered composites consist of corundum Al₂O₃ as main phase and graphite C as minor phase. For Rietveld refinement, the structural parameters of two phases were adapted from database (PDF no.75-1862 for Al₂O₃ and PDF no. 89-7213 for graphite). The peak intensity of graphite phase increases along with the amount of initial vol% of EG in the composite.

Experimental

Powder X-ray diffraction measurements were carried out with a Rigaku DMAX-2200PC X-ray diffractometer equipped with a graphite monochromator ($\lambda = 1.5418 \text{ \AA}$). A step scan mode was used in the 2θ range of 10–110° with a step size of 0.02° and counting time of 5 s for each step.

2. SEM images of sintered alumina/EG composites

Grain size of alumina was determined by intercept method as follows;

$$D \text{ (grain size)} = L / (n \times M)$$

L = length of intercept, n = number of crossing point, M = magnification

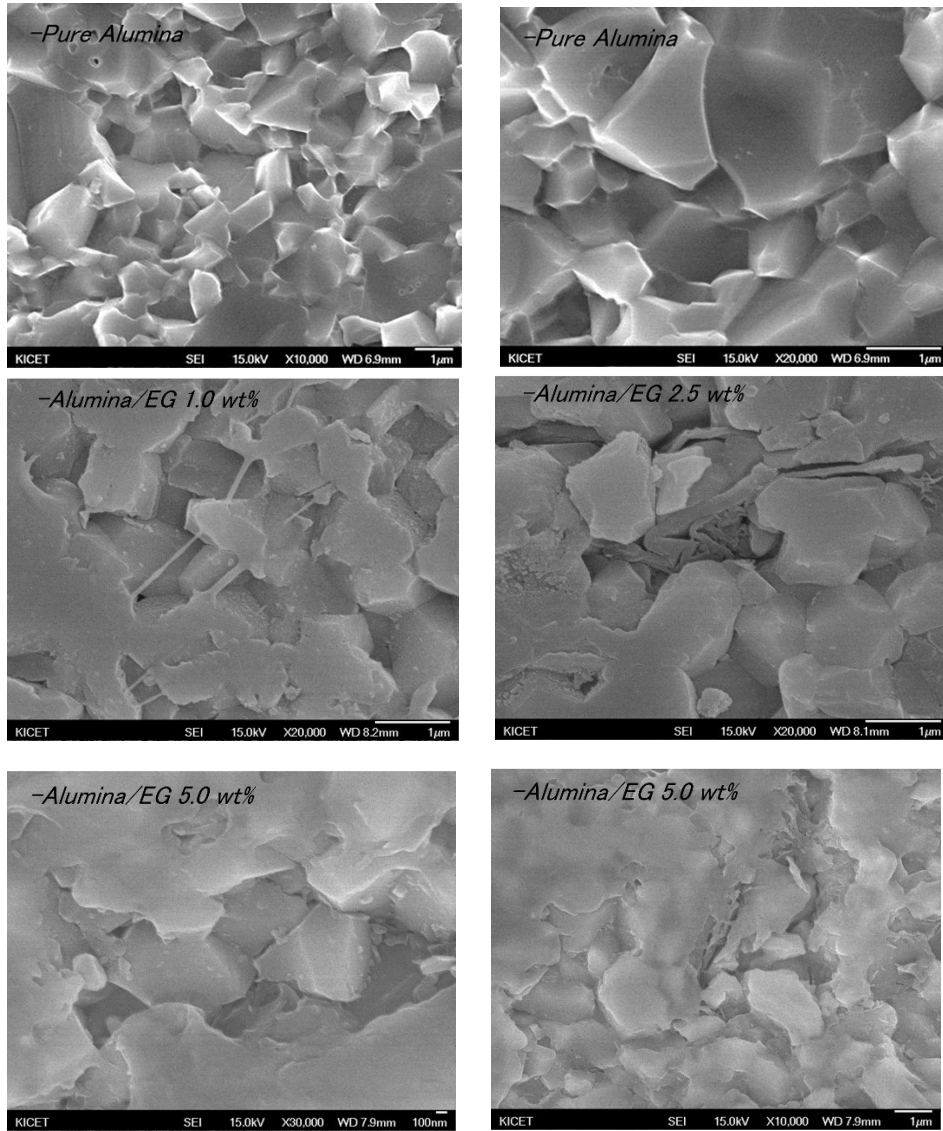


Fig. S2. FE-SEM images for pure alumina and alumina/EG composites.

3. Particle Size Distribution Analysis

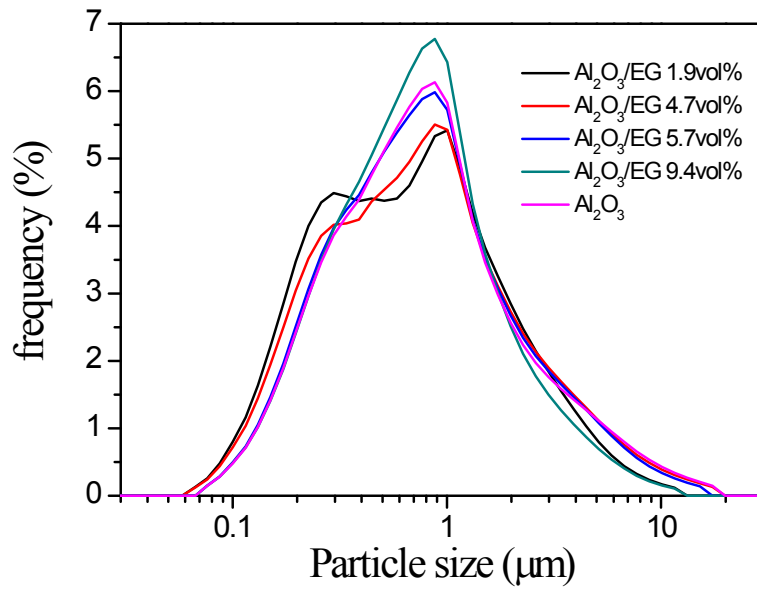


Fig. S3. Particle size distribution analysis for pure alumina and alumina/EG slurries.

Table S1. D50 values for alumina/EG slurries.

sample	D50 (μm)
Al ₂ O ₃ /EG 1.9vol%	1.03
Al ₂ O ₃ /EG 4.7vol%	1.25
Al ₂ O ₃ /EG 5.7vol%	1.21
Al ₂ O ₃ /EG 9.4vol%	1.00
Al ₂ O ₃	1.28

Experimental

Particle size distribution of alumina/EG slurry was measured by dynamic light scattering method using HORIBA LA-950V2.