Integrated process for recovery of rare-earth elements from lamp phosphor waste using methanesulfonic acid

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Figure S1: Four different fractions after sieving the phosphor waste.

Figure S2: Effect of the MSA concentration on the calcium leaching efficiency from the HALO-free residue. Leaching conditions: L/S (L/kg) = 10; t (min) = 120; T (°C) = 80.

Figure S3: ¹H NMR spectra of MSA before (top) and after (bottom) vacuum distillation. Fresh MSA: δ (ppm): 2.54 – 2.58 (3 H, s, CH₃) and 14.10 (1 H, s, SO₃H). Distilled MSA δ (ppm): 2.59 (3 H, s, CH₃) and 14.12 (1 H, s, SO₃H)