Supporting Information

The absolute heating value loss in upgraded coal obtained under different conditions

The absolute heating value loss (ΔLHV) can be calculated according to equation (S1). The results are shown in Figure S1. ΔLHV gradually increased with increasing temperature. ΔLHV in nitrogen and organic atmosphere were very close when temperature was 200 and 300°C, the gap slightly increased when temperature reached 400°C. ΔLHV in organic atmosphere were the smallest, ΔLHV at 400°C was less than 10%.

$$\Delta LHV = \frac{LHV_{ad} - LHV_{char} \times Char\ yield}{LHV_{ad}} \times 100\% \qquad (S1)$$

where, $LHV_{,ad}$: LHV of SL air-dried coal; LHV_{char}: LHV of upgraded coal.

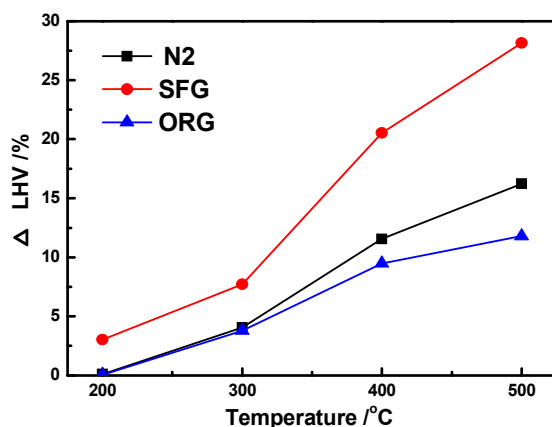**Figure S1.** Effect of temperature and atmosphere on ΔLHV of upgraded coals