

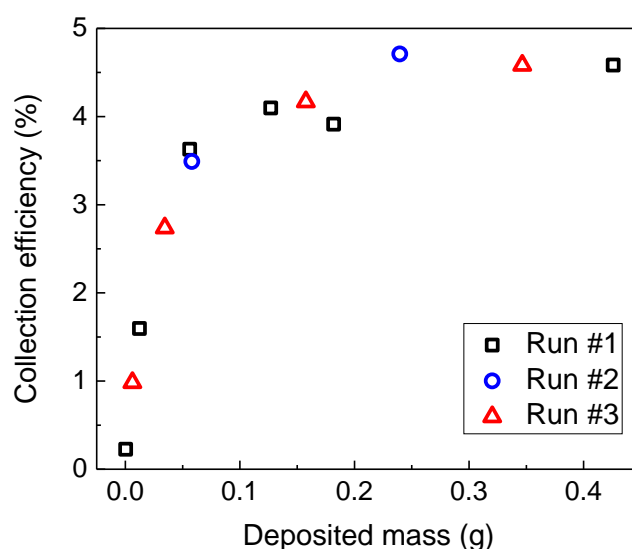
## SUPPORTING INFORMATION

### ***In Situ* Diagnostics on the Dynamic Processes of Ash Deposit Formation, Shedding, and Heat Transfer in a Self-Sustained Down-Fired Furnace**

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#### **1. Reproducibility of the furnace in ash deposition characterization**

Figure S1 shows the ash collection efficiency of ZD lignite, as defined in Section 3.3, for several separate runs of the furnace. The agreements among different runs clearly indicate a good reproducibility of the experimental system in characterizing the ash deposition propensities.

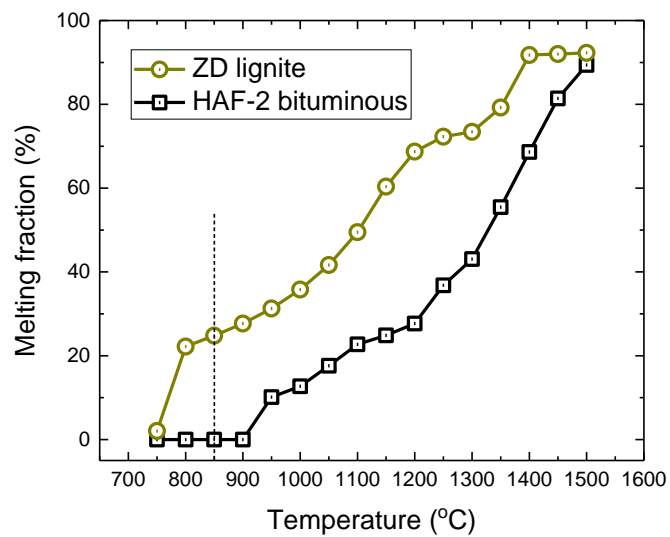


**Figure S1.** Ash collection efficiencies of ZD lignite during several separate runs of the furnace.

#### **2. Melting fraction of ash particles**

The melting fraction of the total ash composition of the two coal samples were revealed from a thermodynamic simulation by FactSage 6.4. Figure S2 shows that, at 850 °C, the total ash of ZD lignite features a melting fraction of ~25 % at, while the total ash of HAF-2 bituminous coal is still unmelted.

The calculation supports a weak strength of the bituminous-formed deposit. Besides, the result implies a reduction in strength of the ash deposit formed by the coal blend, which agrees well with our experiments.



**Figure S2.** Melting fraction of total ash compositions versus the temperature.