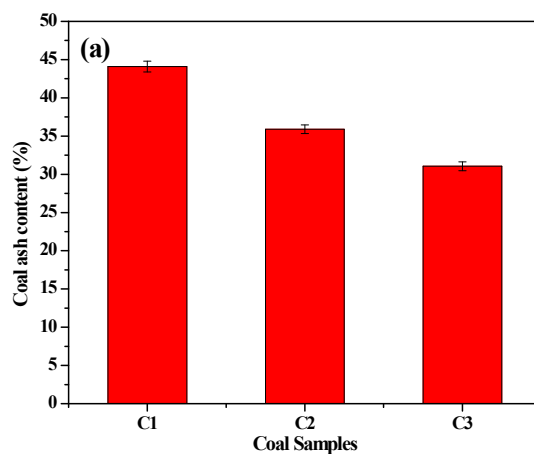
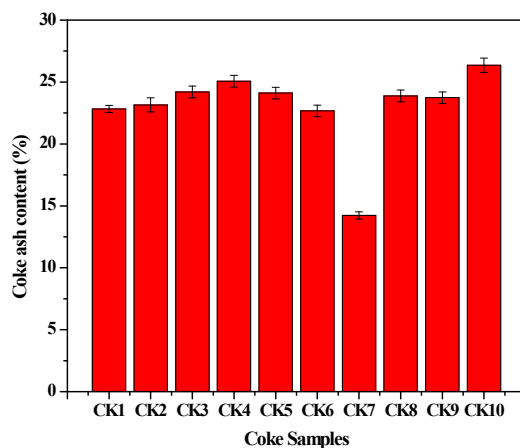


### Supplementary Information



**Fig. 1** Calculated ash contents of three coal samples in terms of combined concentrations of oxides of Na, Mg, Al and Si



**Fig. 2** Determination of ash contents in terms of combined concentrations of oxides of Na, Mg, Al and Si for ten coke samples (CK1 – CK10)