Morphological analysis of mercury in solid wastes from natural gas processing plants: Optimization of temperature-programmed decomposition and desorption method

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Table S1. Designation of pure mercury compound samples

Sample	Concentration			
	SiO_2			Al_2O_3
	0.1%	0.5%	1%	1%
HgS(Red)	0.1%HgS (Red)/SiO_2	0.5%HgS (Red)/SiO_2	1%HgS (Red)/SiO_2	1%HgS(Red)/ Al_2O_3
HgS(Black)	0.1%HgS (Black)/SiO_2	0.5%HgS (Black)/SiO_2	1%HgS (Black)/SiO_2	0.1% HgS (Black)/Al_2O_3
HgO(Red)	/	/	1%HgO(Red)/SiO_2	/
Hg_2Cl_2	/	/	1%Hg_2Cl_2/SiO_2	1%Hg_2Cl_2/Al_2O_3
$HgCl_2$	/	/	/	1%$HgCl_2$/Al_2O_3
$HgSO_4$	/	/	1%$HgSO_4$/SiO_2	1%$HgSO_4$/Al_2O_3

/: Sample not prepared

Table S2. Mercury desorption temperatures of pure mercury compounds

Mercury species	Peak temperature (°C)	Temperature range (°C)	Carrier gas (L/min)	Diluent	Ref.
$HgCl_2$	120±10	70-220	N_2 (0.5)	SiO_2	[1]
Hg_2Cl_2	80±5; 130±10	60-220			
HgS(Black)	205±5; 245±5	170-290			
HgS(Red)	310±10	240-350			
HgO	505±5	430-560			
$HgSO_4$	540±2	500-600			
Hg_2SO_4	280±10	120-480			
$HgCl_2$	105±10	50-280	He (0.5)	SiO_2	[2]
	170±10*	100-250*			
Hg_2Cl_2	110±10	100-250			
HgS(Black)	260±10	60-400			
HgS(Red)	310±10	180-350			
HgO(Yellow)	260±10	250-400			
$HgSO_4$	405±10	200-620			
	580±10				
$HgCl_2$	138±4	90-350	Air (1.0)	Pure	[3,4]
Hg_2Cl_2	119±13	60-250			
HgS(Black)	190±11	150–280			
HgS(Red)	305±12	210-340			
HgO(Red)	308±1; 471±5	200-360; 37-530			
HgO(Yellow)	284±7; 469±6	190-380; 320-540			
$Hg(NO_3)_2 \cdot H_2O$	215 ± 4; 280 ± 13	150-370; 375-520			
$HgSO_4$	460 ± 25	400-600			
	583 ± 8				
$HgCl_2$	90±10*	60-400	N_2 (0.5)	SiO_2	This study
Hg_2Cl_2	120±5	65-240			
HgS(Black)	230±10	180-340			
HgS(Red)	308±10	201-420			
	460±10				
HgO(Red)	330±10	195-515			
$HgSO_4$	590±10	480-600			

*: Diluted by Al_2O_3

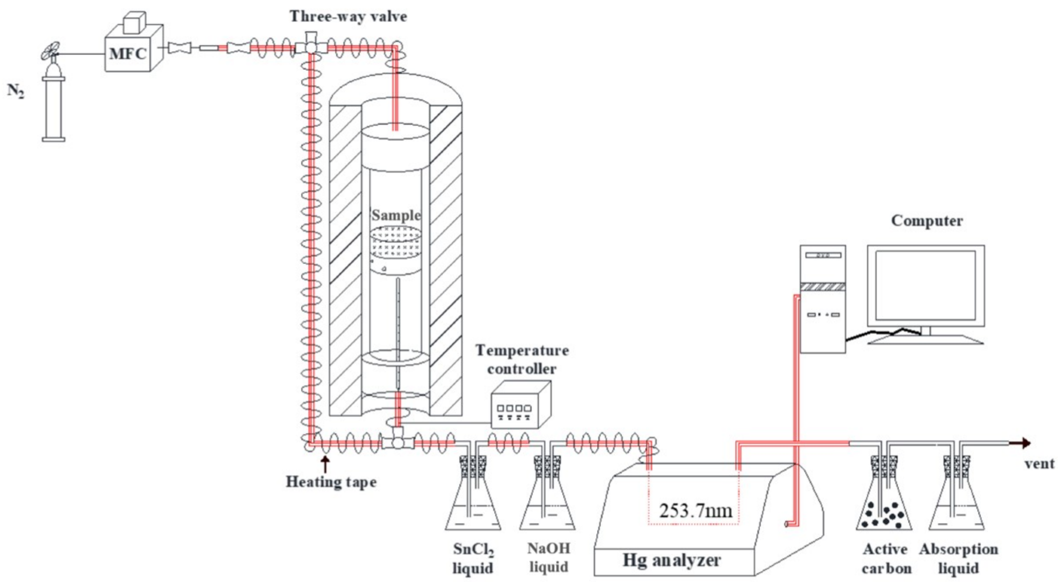

Figure S1. Schematic diagram of the fixed-bed reactor for the TPDD experiment

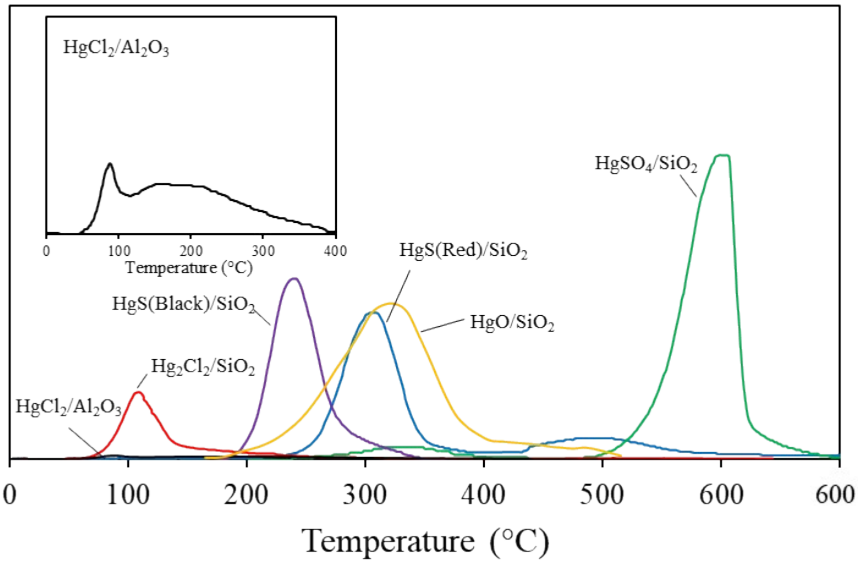

Figure S2. TPDD curves of HgS(Black), HgS(Red), $HgCl_2$, Hg_2Cl_2, HgO(Red) and $HgSO_4$ supported over SiO_2 or Al_2O_3

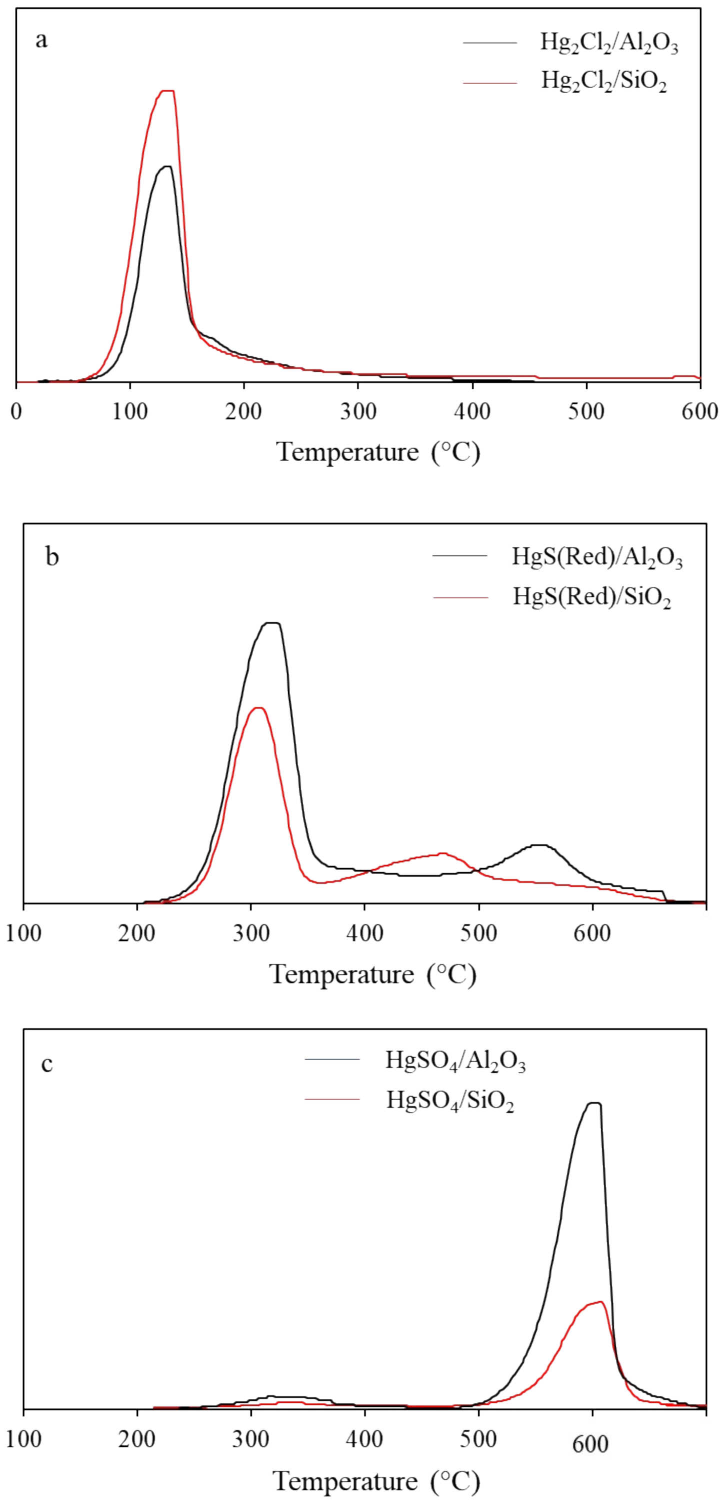

Figure S3. Effect of supporter on the desorption temperatures of (a) Hg_2Cl_2, (b) HgS(Red) and (c) $HgSO_4$

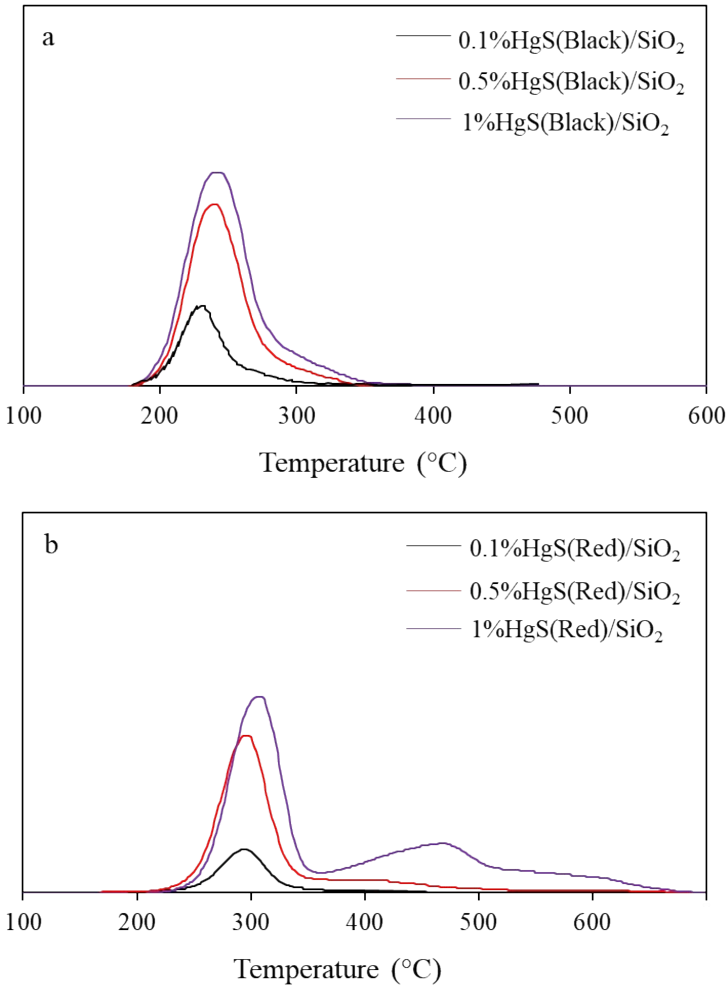

Figure S4. Effect of (a) HgS(Black) and (b) HgS(Red) concentrations on mercury desorption peak

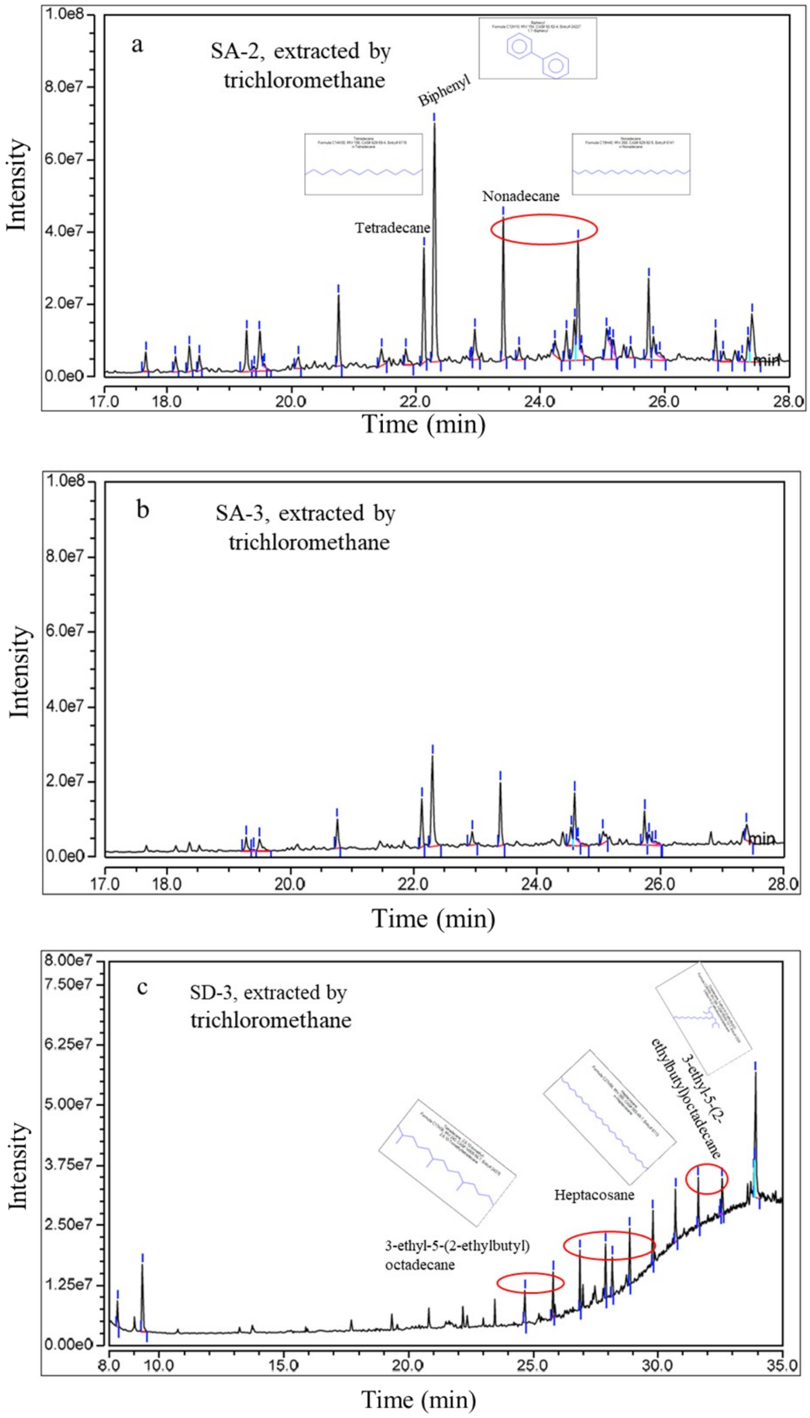

Figure S5. Oil components over (a) SA-2, (b) SA-3 and (c) SD-3

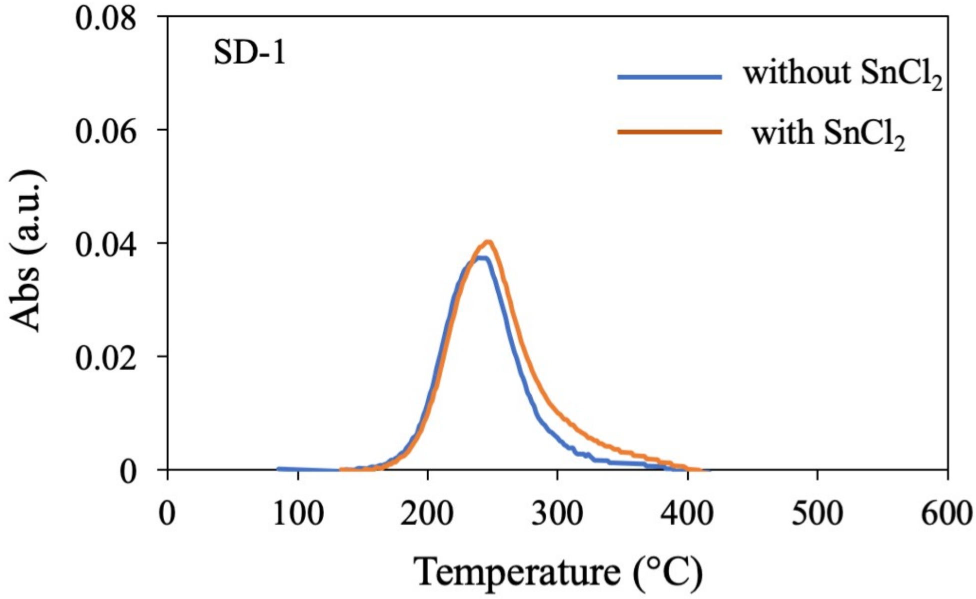

Figure S6. TPDD curves of SD-1 with and without passing through the $SnCl_2$ solution

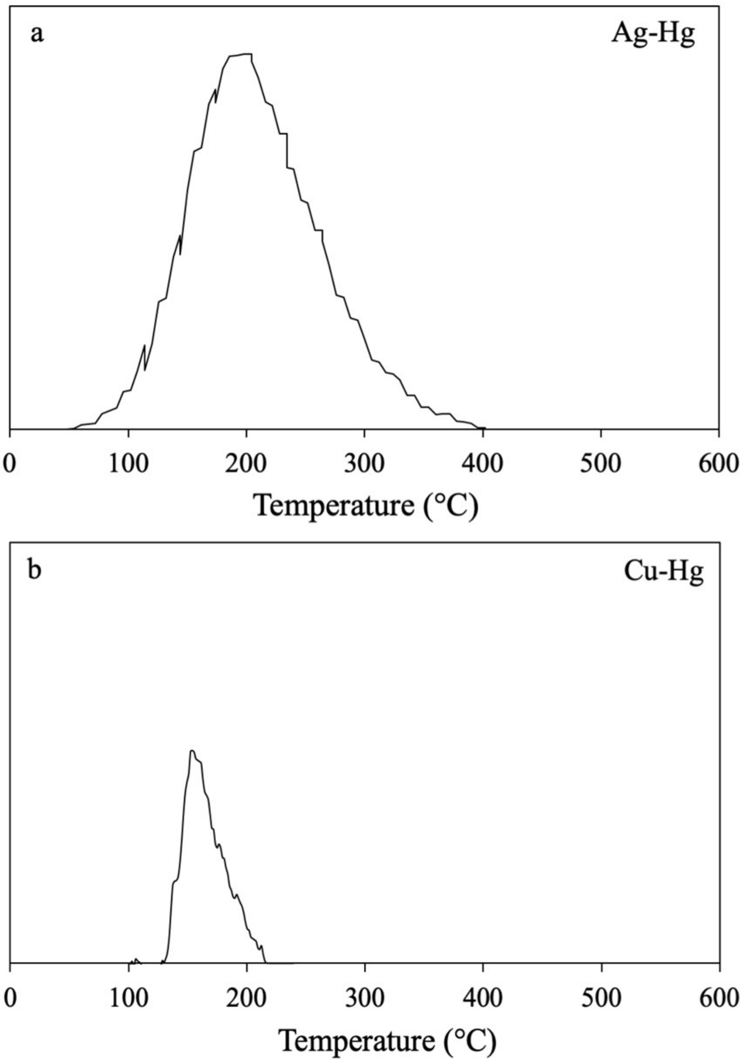

Figure S7. TPDD desorption curves of (a) Ag-Hg and (b) Cu-Hg amalgam

References

1. Lopez-Anton MA, Yuan Y, Perry R, Maroto-Valer MM. Analysis of mercury species present during coal combustion by thermal desorption. Fuel 2010;89:629-34.

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4. Rumayor M, Diaz-Somoano M, Lopez-Anton MA, Martinez-Tarazona MR. Mercury compounds characterization by thermal desorption. Talanta 2013;114:318-22.