

Supplementary Information

ST-1 Effects of variation of counting time from 50 to 600 s, on various parameters

Parameter monitored		Pure CaCO ₃ (Pellet A)	SrCO ₃ to CaCO ₃ in the weight ratios of:		Pure SrCO ₃ (Pellet D)	Observations
			1:2 (Pellet B)	2: 1 (Pellet C)		
Dead time		1	16	25	17	All are constant.
Gross cts		1064 to 1078	18295 to 18387	28732 to 28632	19226 to 19446	All are increasing marginally, except C.
% of net counts at the ROI for	Ca	97.6 to 98.1	94.3 to 95.3	88.6 to 88.8	-7.6 to 20.1	Marginal variations for A, B and C. Substantial increase for D.
	Sr	77.1 to 75.5	98.0 to 97.9	97.8 to 97.9	97.9 to 98.0	All are decreasing marginally, except C.
	Compton peak	52.4 to 46.2	42.9 to 42.2	36.2 to 35.4	35.8 to 31.8	All are decreasing
	Rayleigh peak	61.7 to 56.8	59.7 to 60.2	60.4 to 63.0	63.3 to 60.1	Decreasing for A and D. Increasing for B and C.
Net counts per unit time (count rate) for	Ca	344.0 to 343.2	166.5 to 162.1	75.5 to 69.6	-0.44 to 1.2	All are decreasing, except D
	Sr	30.4 to 28.5	16006.6 to 15571.5	26502 to 25964	17611 to 17240	All are decreasing.
	Compton peak	101.9 to 88.8	51.2 to 49.5	30.9 to 28.8	18.7 to 15.7	All are decreasing.
	Rayleigh peak	64.2 to 57.1	49.5 to 48.4	39.4 to 40.9	25.4 to 24.2	All are decreasing, except C.
Ratio of net counts:	Sr to Ca	0.0885 to 0.0830	96.11 to 96.15	360.6 to 367.0	40026 to 14527	Increasing marginally for A, B and C. Increasing substantially for D.
	Rayleigh to	0.6305 to	0.9676 to	1.2744	1.4604 to	All are increasing.

	Compton	0.6435	0.9777	to 1.4218	1.5383	
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ST-2 Effects of variation of emission current from 50 to 200 μ A on various measurands

Parameter monitored		Pure CaCO ₃ (Pellet A)	SrCO ₃ to CaCO ₃ in the weight ratios of:		Pure SrCO ₃ (Pellet D)	Observations
			1:2 (Pellet B)	2: 1 (Pellet C)		
Dead time		3 to 22	2 to 39	4 to 55	4 to 41	All are increasing gradually.
Gross crs		148 to 2928	2366 to 49894	15940 to 79040	4317 to 53442	All are increasing gradually.
% of net counts at the ROI for	Ca	97.7 to 97.9	97.2 to 95.9	84.1 to 87.7	47.9 to 4.4	Marginal variations for A,B and C. Substantial reduction for D.
	Sr	97.7 to 97.9	97.9 to 97.8	97.9 to 97.8	98.1 to 97.9	All are decreasing marginally.
	Compton peak	77.3 to 75.8	67.1 to 41.8	57.3 to 35.3	37.0 to 38.1	Decreasing for A, B and C. Increasing for D.
	Rayleigh peak	41.4 to 47.9	65.6 to 56.9	71.1 to 59.1	57.8 to 61.0	Increasing for A and D. Decreasing for B and C.
Net counts per unit current for	Ca	50.9 to 55.4	40.4 to 341	15.1 to 127	0.0155 to 0.0159	All are increasing.
	Sr	94.6 to 483	3750 to 32820	6064 to 48118	83.3 to 106.2	All are increasing.
	Compton peak	8.5 to 39.9	19.3 to 105.3	10.8 to 55.1	0.060 to 0.115	All are increasing.
	Rayleigh peak	21.5 to 128.1	12.6 to 98.4	11.6 to 71.1	0.079 to 0.152	All are increasing.
Ratio of net counts:	Sr to Ca	0.0903 to 0.0825	92.86 to 96.49	400.5 to 380.3	5368 to 66751	Marginal decrease for A, B and C. Substantial increase for D.
	Rayleigh to Compton	0.6660 to 0.6081	0.6556 to 0.8645	1.0683 to 1.2909	1.3256 to 1.3189	Marginal decrease for A and D. Marginal increase

						for B and C.
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ST-3 Effects of variation of applied voltage from 20 to 40 kV, on various parameters

Parameter monitored		Pure CaCO ₃ (Pellet A)	SrCO ₃ to CaCO ₃ in the weight ratios of:		Pure SrCO ₃ (Pellet D)	Observations
			1:2 (Pellet B)	2: 1 (Pellet C)		
Dead time		10 to 2	1 to 25	2 to 36	1 to 26	All are increasing gradually, except for A.
Gross crs		57 to 1685	500 to 29075	749 to 45648	539 to 30637	All are increasing gradually.
% of net counts at the ROI for	Ca	99.9 to 98.1	95.3 to 94.1	97.1 to 88.1	-18.8 to 10.3	All are decreasing, except for D.
	Sr	59.3 to 75.3	97.4 to 97.9	97.7 to 97.9	97.8 to 97.9	All are elevated marginally.
	Compton peak	15.4 to 51.1	-44.1 to 49.1	19.0 to 49.5	52.0 to 31.9	All are rising gradually and reaching the same value, except D.
	Rayleigh peak	4.8 to 56.8	44.9 to 68.0	56.5 to 68.0	25.3 to 65.7	All are increasing, and reaching the same value at higher potentials, except A.
Net counts per unit voltage for	Ca	121 to 1330	41 to 841	19 to 414	-0.15 to 2.6	All are increasing.
	Sr	11.1 to 91.3	1940 to 87100	3000 to 157500	2230 to 72126	All are increasing.
	Compton peak	0.7 to 287	-1.5 to 347	0.4 to 262	0.7 to 68.2	All are increasing.
	Rayleigh peak	2.4 to 168	55 to 340	51 to 316	0.05 to 123	All are increasing.
Ratio of net counts:	Sr to Ca	0.0925 to 0.0811	47.7 to 98.3	161.4 to 377.8	14865 to 28010	All are increasing.
	Rayleigh to	0 to	0 to	0 to	0.0769 to	All are increasing.

	Compton	0.6006	0.8919	1.0918	1.8035	
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ST-4 ROI of various X-rays peaks and the counts data for the representative EDXRF spectrum shown in Fig. 6

Identification of the peak	ROI (keV)	Gross counts at the ROI	Net counts at the ROI	% of net counts at the ROI
Ca	3.46 to 3.84	18194	17310	95.1
Sr	13.70 to 14.44	1675915	1640599	97.9
Compton	18.50 to 19.84	12577	5809	46.2
Rayleigh	19.90 to 20.52	8593	5207	60.6

ST-5 Calculated values of the mass thickness (mg cm^{-2}) for thin, thick and critical thickness (μm) of the samples for 300 mg mixtures / pellets, having 10 mm diameter

Sl. No.	Description	Mass thickness (mg cm^{-2})				$t_{\text{crit,Ca}}$ (μm)	$t_{\text{crit,Sr}}$ (μm)
		For Ca X-rays		For Sr X-rays			
		Thin	Thick	Thin	Thick		
1	Pure CaCO_3	0.43	19.67	2.93	135.1	1.19	8.14
2	Pure CaF_2	0.34	15.67	2.29	105.7	0.94	6.37
3	1:2 SrCO_3 to CaCO_3	0.19	8.94	2.03	93.4	0.54	5.63
4	1:1 SrCO_3 to CaCO_3	0.15	7.02	1.75	80.9	0.42	4.87
5	2:1 SrCO_3 to CaCO_3	0.13	5.78	1.55	71.3	0.35	4.30
6	1:2 SrCO_3 to CaF_2	0.18	8.29	1.80	82.7	0.50	4.99
7	1:1 SrCO_3 to CaF_2	0.15	6.71	1.62	74.6	0.40	4.50
8	2:1 SrCO_3 to CaF_2	0.12	5.64	1.48	68.0	0.34	4.10
9	1:2 $\text{Sr}(\text{NO}_3)_2$ to CaCO_3	0.23	10.76	2.39	110.3	0.65	6.64
10	1:1 $\text{Sr}(\text{NO}_3)_2$ to CaCO_3	0.19	8.77	2.19	101.0	0.53	6.08
11	2:1 $\text{Sr}(\text{NO}_3)_2$ to CaCO_3	0.16	7.40	2.02	93.1	0.45	5.61
12	1:2 $\text{Sr}(\text{NO}_3)_2$ to CaF_2	0.21	9.84	2.08	95.8	0.59	5.77
13	1:1 $\text{Sr}(\text{NO}_3)_2$ to CaF_2	0.18	8.30	1.98	91.5	0.50	5.51
14	2:1 $\text{Sr}(\text{NO}_3)_2$ to CaF_2	0.16	7.17	1.90	87.5	0.43	5.27
15	Pure SrCO_3	0.09	4.27	1.25	57.7	0.26	3.48
16	Pure $\text{Sr}(\text{NO}_3)_2$	0.12	5.64	1.75	80.6	0.34	4.86

ST-6 Comparison between the calculated and measured ratio of net counts of Sr to Ca in synthetic standards

Targeted composition mixture / pellet	Mass absorption coefficient for			Weight ratio of Sr to Ca, taken during measurements	Ratio of net counts, Sr to Ca			
	X-ray source	Ca K_{α} X-rays	Sr K_{α} X-rays		Calculated, R_{cal}	Measured, R_{meas}	Absolute error ($R_{cal} - R_{meas}$)	Relative error (%)
~1:2 SrCO ₃ to CaCO ₃	16.538	348.279	18.381	0.753	76.45	85.51	-9.06	-10.5
~1:1 SrCO ₃ to CaCO ₃	21.958	442.396	18.354	1.453	140.97	148.15	-7.18	-4.8
~2:1 SrCO ₃ to CaCO ₃	27.379	536.514	18.328	2.906	259.47	249.43	+10.04	+4.0
~1:2 SrCO ₃ to CaF ₂	17.577	375.439	21.820	0.544	56.94	63.43	-6.49	-10.2
~1:1 SrCO ₃ to CaF ₂	22.737	462.766	20.934	1.163	106.13	114.00	-7.87	-6.9
~2:1 SrCO ₃ to CaF ₂	27.898	550.094	20.047	2.194	197.78	182.20	+15.58	+8.6
~1:2 Sr(NO ₃) ₂ to CaCO ₃	12.770	290.308	16.796	0.493	59.36	64.87	-5.51	-8.5
~1:1 Sr(NO ₃) ₂ to CaCO ₃	16.306	355.441	15.977	1.018	115.46	110.55	+4.91	+4.4
~2:1 Sr(NO ₃) ₂ to CaCO ₃	19.842	420.573	15.159	2.555	222.49	221.52	+0.97	+0.44
~1:2 Sr(NO ₃) ₂ to CaF ₂	13.808	317.468	20.235	0.431	43.96	39.98	+3.98	+9.9
~1:1 Sr(NO ₃) ₂ to CaF ₂	17.085	375.811	18.557	0.806	86.22	80.12	+6.10	+7.6
~2:1 Sr(NO ₃) ₂ to CaF ₂	20.361	434.153	16.878	1.632	168.34	174.91	-6.57	-3.8