Supplementary material

Bucchero Ware from the Etruscan Town of Tarquinia (Italy): A Study of the Production Site and Technology through Spectroscopic Techniques and Multivariate Data Analysis

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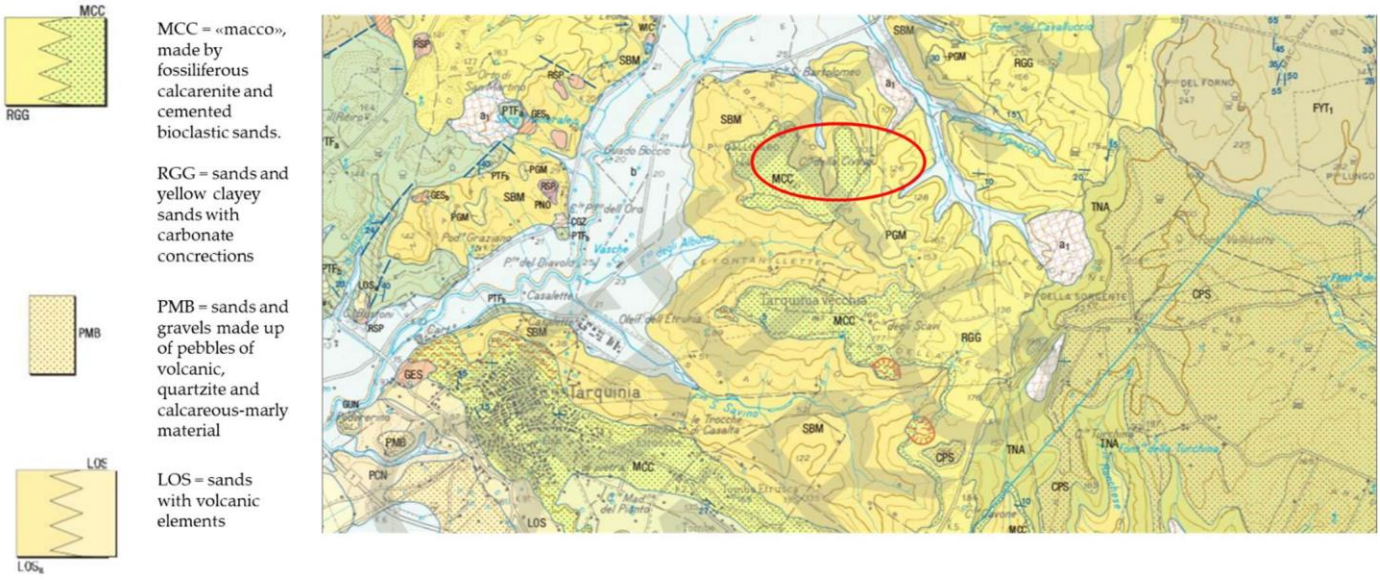

Figure S1. Detail of the geological map of the area of Tarquinia (central Italy) [28]. The red ellipse indicates the site of La Civita.

Table S1. Elemental composition data, expressed as percent in weight and normalized to 100%, for the bucchero samples from the excavation of La Civita di Tarquinia. For the more abundant elements the percentages of the corresponding oxides were considered.

Sample	CaO	Fe_2O_3	MgO	K_2O	Na_2O	Cr	Cu	Ni	Mn
1	18.2	41.5	2.0	28.1	9.8	0.102	0.115	0.075	0.16
3	13.8	46.6	3.8	25.5	10.0	0.053	0.034	0.036	0.23
3/2	61.5	22.6	5.0	7.0	3.4	0.075	0.088	0.041	0.33
7/4	62.0	21.1	6.2	7.1	3.2	0.054	0.056	0.028	0.23
9	53.0	23.1	6.6	13.3	3.6	0.055	0.045	0.020	0.24
12/163	64.2	18.5	6.5	6.7	3.8	0.044	0.076	0.035	0.21
13	51.3	24.1	7.5	14.1	2.2	0.045	0.049	0.023	0.57
15/1/2	63.7	18.7	5.8	7.6	3.8	0.063	0.063	0.046	0.35
19	9.9	42.5	6.4	31.0	9.5	0.036	0.021	0.025	0.57
22	45.7	26.1	8.5	15.7	3.5	0.037	0.012	0.020	0.38
125/22	47.9	28.9	10.4	8.1	4.0	0.082	0.080	0.045	0.48
193/11	63.1	20.2	6.9	6.8	2.6	0.059	0.037	0.033	0.22

197/6	17.5	51.6	7.7	15.7	6.9	0.042	0.176	0.162	0.28
202/7	64.9	19.7	5.9	6.6	2.5	0.064	0.049	0.036	0.27
215/4	69.8	15.4	4.0	7.3	3.2	0.031	0.053	0.077	0.12
339/18	41.7	33.3	7.4	12.5	4.4	0.058	0.131	0.081	0.48
437/122	58.4	24.6	5.2	7.9	3.5	0.034	0.044	0.086	0.29
632/34	68.7	15.2	5.1	6.8	3.8	0.078	0.033	0.045	0.24
663/2	15.2	48.3	7.7	19.6	8.4	0.109	0.171	0.078	0.50
681/49	8.6	55.9	7.2	19.8	7.6	0.138	0.156	0.074	0.61
763/1	7.6	53.6	8.5	21.4	8.2	0.065	0.164	0.037	0.42
779/1	39.3	35.0	8.3	11.8	4.8	0.106	0.068	0.044	0.65
801/10	47.2	26.5	8.0	14.6	2.7	0.067	0.412	0.000	0.55
801/11	51.2	26.2	8.6	10.7	2.7	0.065	0.001	0.002	0.58
801/16	54.2	25.1	7.8	9.9	2.4	0.063	0.002	0.000	0.53
845/1	39.0	36.3	5.7	12.9	5.8	0.009	0.060	0.064	0.30
845/2	62.8	20.0	5.5	7.8	3.5	0.069	0.057	0.045	0.31
A40/2	2.7	49.4	15.9	19.3	11.9	0.156	0.180	0.076	0.32
Aa10/30	37.2	31.9	11.3	14.8	4.1	0.115	0.110	0.047	0.47
Ac10/23	6.3	45.0	9.5	28.1	9.9	0.086	0.348	0.061	0.57
Ac23/22	56.4	22.3	7.0	10.7	3.1	0.075	0.177	0.047	0.28
Ac23/31	65.2	16.9	5.1	7.3	4.8	0.051	0.077	0.313	0.27
Ac54/43	53.5	22.5	6.9	13.5	3.0	0.062	0.073	0.029	0.44

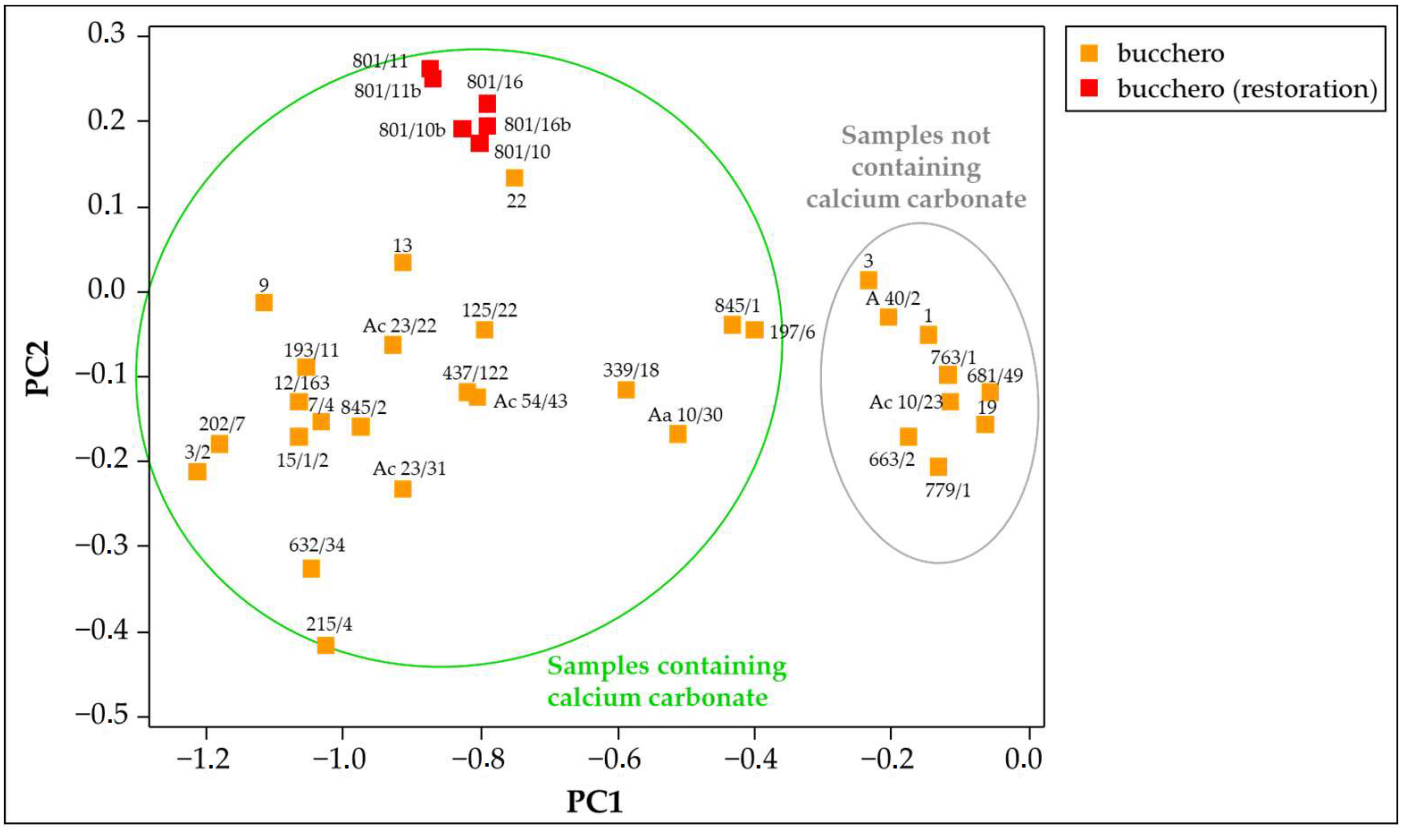

Figure S2. Score plot of the first two principal components of the second-derivative FTIR spectra of bucchero pottery (orange and red squares) from the excavation of La Civita di Tarquinia; the red squares indicate the bucchero samples examined in view of a virtual reconstruction (see text, Section 3.3.).

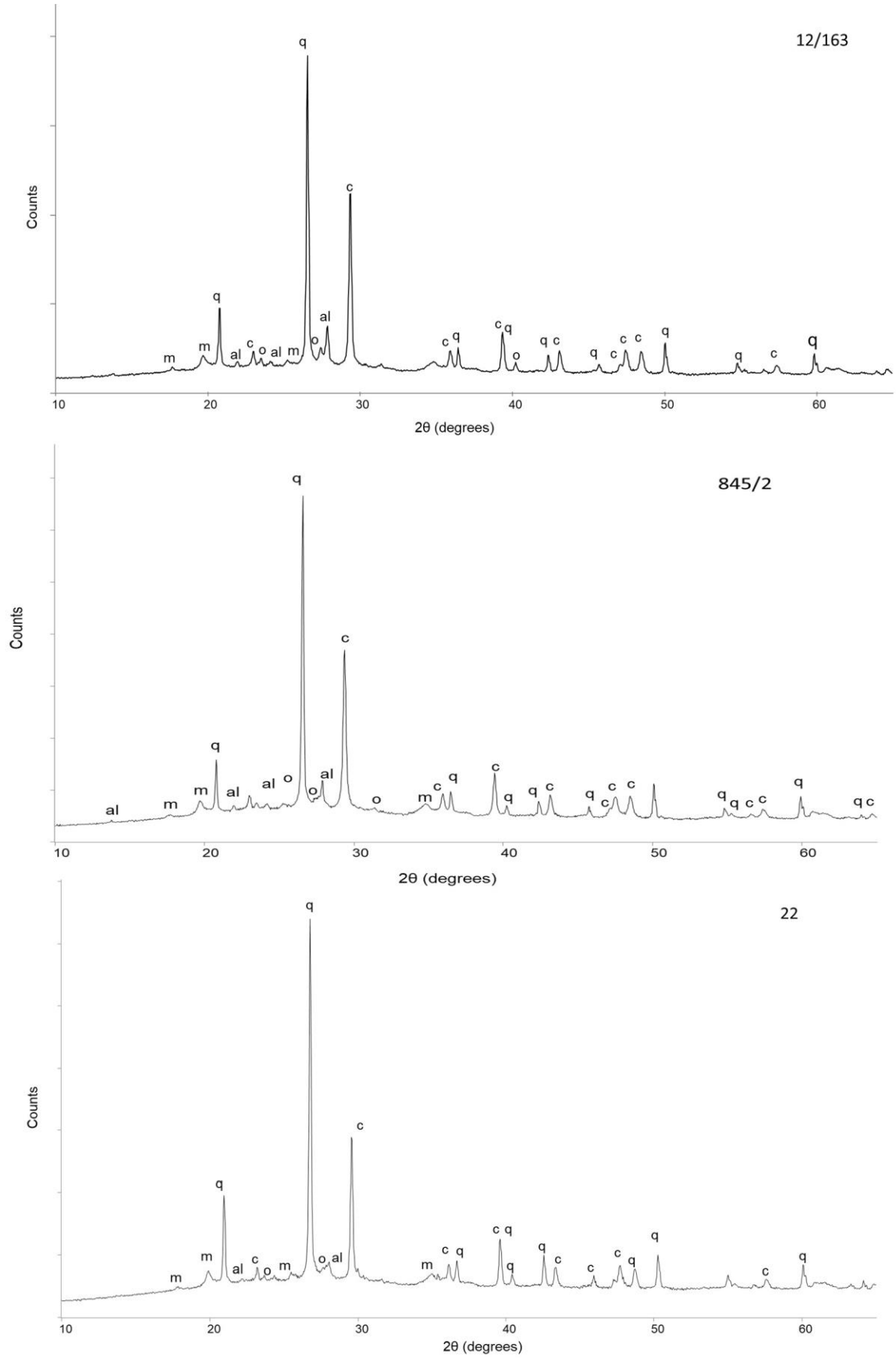

Figure S3. XRD patterns of bucchero samples from the excavation of La Civita di Tarquinia. Legend: al = albite; an = anorthite; c = calcite; f = Na-feldspar; m = muscovite; mi = microcline; o = orthoclase; q = quartz.

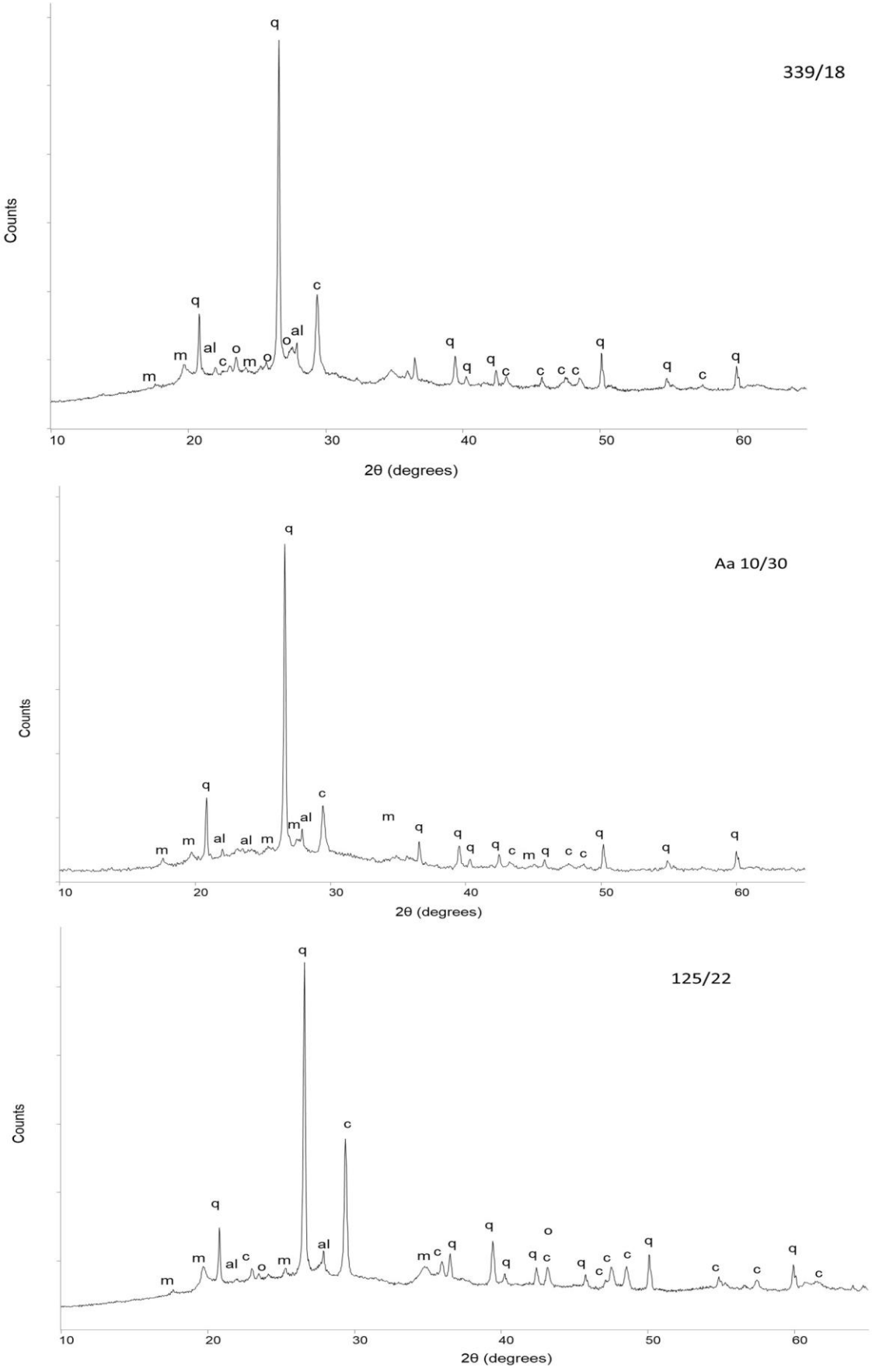

Figure S3. (continued).

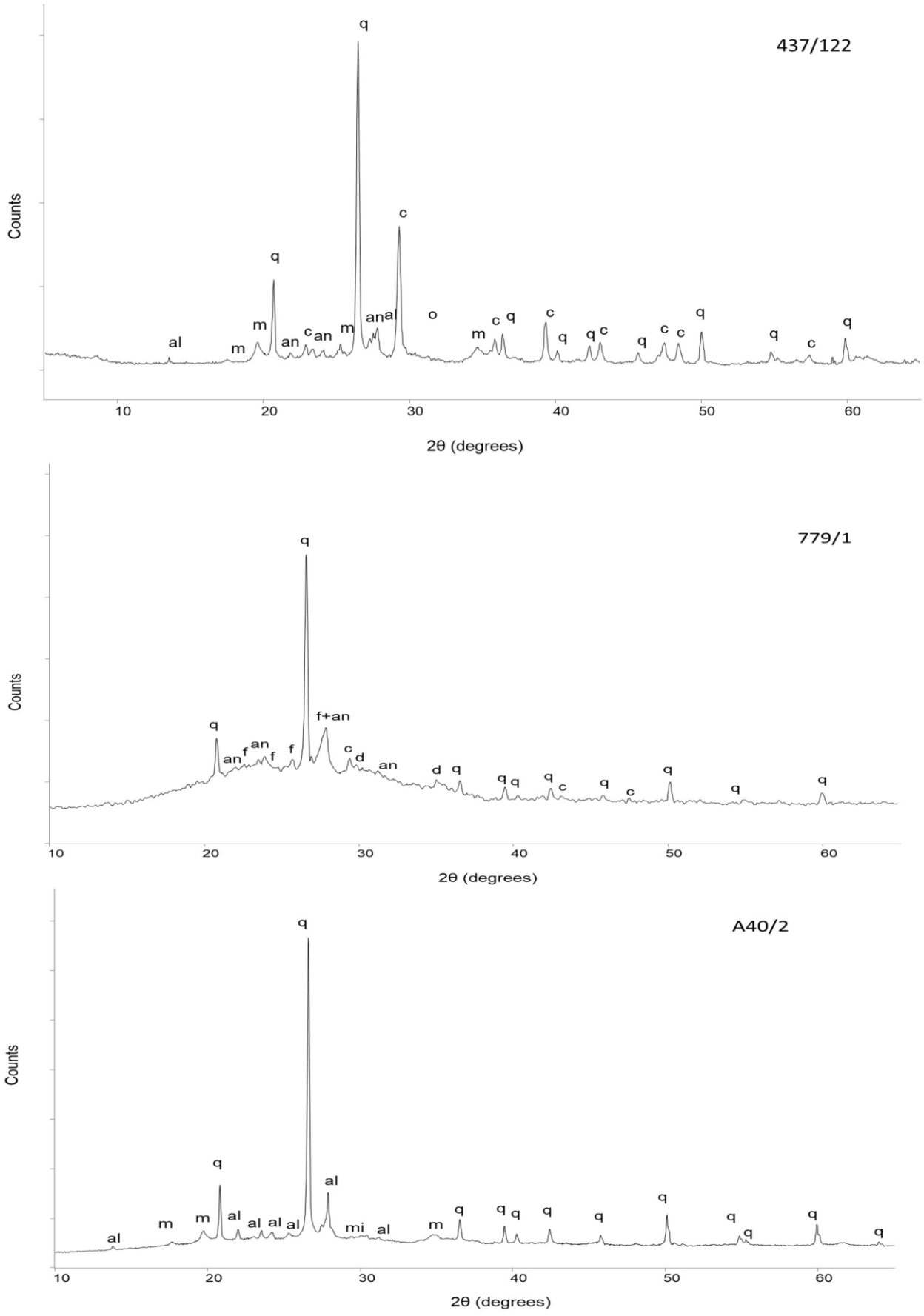

Figure S3. (continued).

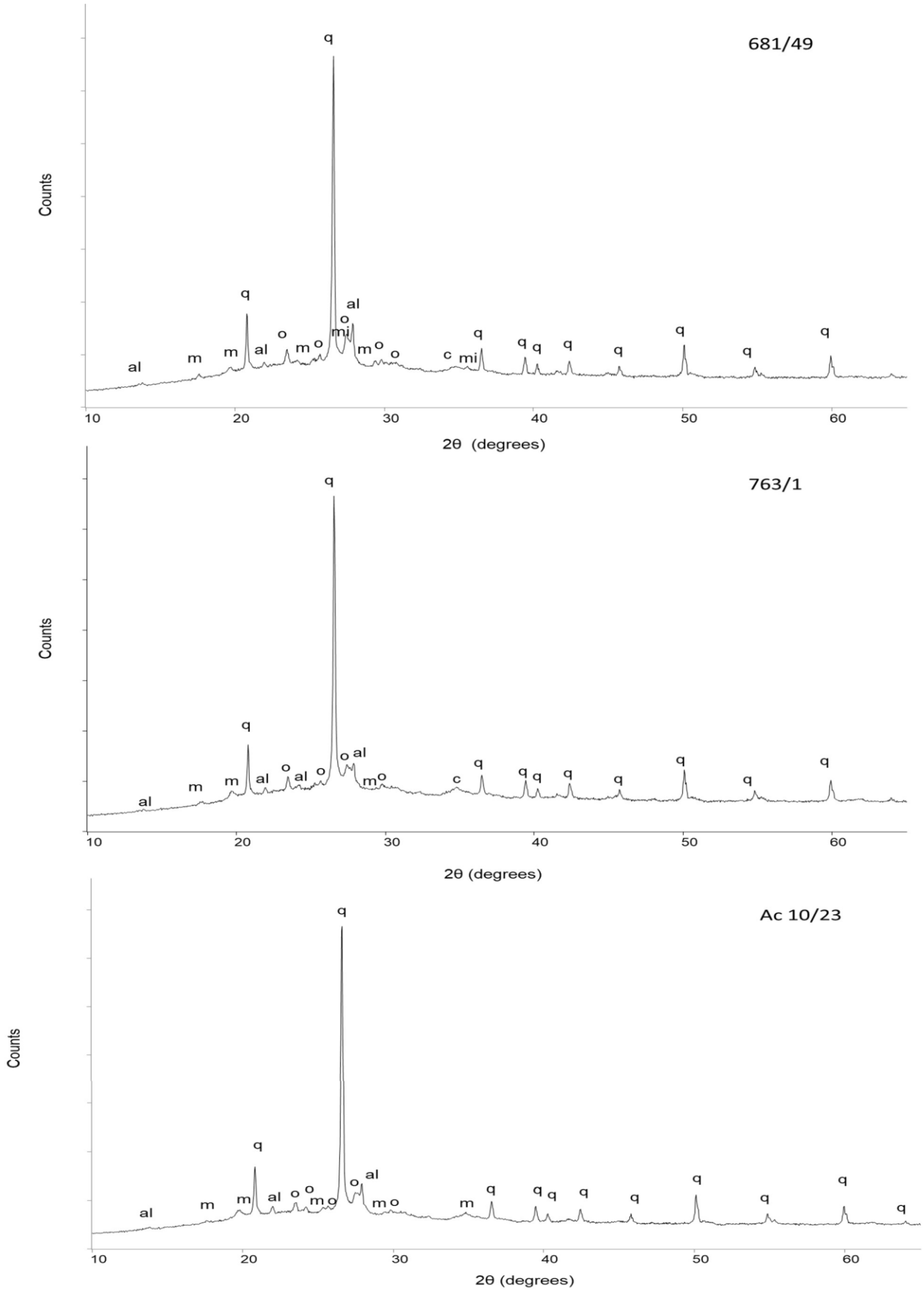

Figure S3. (continued).

Table S2. Positions and relative intensities of XRD peaks for bucchero samples from the excavation of La Civita di Tarquinia. The mineralogical phases identified are also indicated, with the ICDD numbers of the reference patterns.

Samples														Reference phases (ICDD number)
12/163		845/2		22		339/18		Aa10/30		125/22		437/122		
2θ	I%	2θ	I%	2θ	I%	2θ	I%	2θ	I%	2θ	I%	2θ	I%	
17.70	8	-	-	-	-	-	-	17.69	6	-	-	-	-	Muscovite 2M1 (01-080-0743)
19.70	11	19.71	12	19.75	12	19.70	16.00	19.72	8	19.71	12	19.64	7	Muscovite 2M1
20.79	25	20.79	24	20.80	31	20.80	30.00	20.87	24	20.79	24	20.76	26	Quartz alpha (01-089-8935)
21.96	9	21.96	11	-	-	21.97	16	22.03	10	21.96	11	21.88	5	Albite (00-009-0466)
23.01	12	23.00	13	23.08	12	-	-	-	-	23.00	13	22.93	8	Calcite (01-072-1937)
23.51	10	23.48	11	23.49	11	23.49	18	-	-	23.48	11	23.43	7	Albite
-	-	-	-	-	-	-	-	-	-	-	-	24.14	6	Albite Anorthite (01-073-0265)
-	-	-	-	-	-	-	-	-	-	-	-	25.31	9	Muscovite 2M1
-	-	-	-	-	-	25.68	17	-	-	-	-	-	-	Orthoclase (01-076-0825)
26.57	100	26.57	100	26.59	100	26.58	100	26.64	100	26.57	100	26.49	100	Quartz alpha
-	-	27.32	13	-	-	-	-	-	-	27.32	13	27.34	11	Muscovite 2M1 Anorthite
27.43	13	-	-	-	-	27.49	21	-	-	-	-	-	-	Orthoclase
-	-	-	-	-	-	-	-	-	-	-	-	27.52	13	Anorthite
27.86	20	27.87	18	27.90	13	27.89	22	27.89	14	27.87	18	27.82	13	Albite Anorthite
29.37	59	29.37	55	29.39	45	29.37	35	29.41	21	29.37	55	29.29	45	Calcite
34.85	10	34.81	11	34.88	11	34.78	15	-	-	34.81	11	34.66	7	Muscovite 2M1
35.95	13	35.94	14	35.97	13	35.95	15	-	-	35.94	14	35.89	9	Calcite
36.49	14	36.49	14	36.49	14	36.49	18	36.54	12	36.49	14	36.39	11	Quartz alpha
39.40	18	39.40	20	39.41	19	39.41	19	39.52	9	39.40	20	39.34	15	Calcite; Quartz alpha
40.23	9	40.23	10	40.25	11	40.24	14	40.32	6	40.23	10	40.13	5	Quartz alpha
42.39	11	42.38	12	42.37	16	42.39	15	42.46	8	42.38	12	42.28	8	Quartz alpha
43.13	12	43.14	13	43.15	12	43.17	14	43.27	5	43.14	13	43.07	9	Calcite
45.74	9	45.73	10	45.74	11	45.74	13	45.78	7	45.73	10	45.67	5	Quartz alpha
47.50	13	47.47	13	47.51	13	47.50	13	47.57	5	47.47	13	47.37	9	Calcite
48.51	12	48.48	13	48.52	12	48.49	13	48.62	4	48.48	13	48.47	8	Calcite
50.08	15	50.08	17	50.09	16	50.09	19	50.12	12	50.08	17	50.01	12	Quartz alpha
54.81	9	54.81	10	54.81	11	54.82	13	54.83	5	54.81	10	54.77	5	Quartz alpha
55.27	7	55.27	8	-	-	55.28	12	-	-	55.27	8	-	-	Quartz alpha
56.57	7	56.57	8	-	-	-	-	-	-	56.57	8	-	-	Calcite
57.40	9	57.42	9	57.36	10	57.42	11	-	-	57.42	9	57.34	4	Calcite
59.89	12	59.88	13	59.89	13	59.91	16	59.96	9	59.88	13	59.84	10	Quartz alpha
63.97	7	63.97	8	63.97	9	-	-	-	-	63.97	8	-	-	Quartz alpha

Table S2. (continued).

Sample		Reference phases (ICDD number)
779/1		
2θ	I%	
20.84	31	Quartz alpha (01-089-8935)
23.53	21	Anorthite (01-073-0265)
23.96	22	Feldspar (Na-component) (01-089-8575)
25.74	23	Feldspar (Na-component)
26.63	100	Quartz alpha
27.84	31	Anorthite Feldspar (Na-component)
29.37	22	Calcite
29.86	20	Diopside (01-089-0837)
35.03	15	Diopside (01-089-0837)
36.63	14	Quartz alpha

39.45	13	Quartz alpha
42.41	12	Quartz alpha
45.85	9	Quartz alpha
50.10	16	Quartz alpha
59.93	10	Quartz alpha

Table S2. (continued).

Samples								Reference patterns (ICDD number)
A40/2		**681/49**		**763/1**		**Ac10/23**		
2θ	I%	2θ	I%	2θ	I%	2θ	I%	
17.61	8	17.58	11	-	-	-	-	Muscovite 2M1 (01-080-0743)
19.70	11	19.70	12	19.67	13	19.80	13	Muscovite 2M1
20.82	25	20.80	28	20.79	26	20.83	26	Quartz alpha (01-089-8935)
22.00	11	-	-	21.93	14	21.99	14	Albite (00-009-0466)
23.53	11	23.48	18	23.47	17	23.55	15	Albite
24.21	11	-	-	24.21	14	24.23	14	Albite Muscovite 2M1
25.29	10	-	-	25.26	15	-	-	Albite
-	-	25.69	16	25.69	16	25.68	14	Orthoclase (01-076-0825)
26.61	100	26.59	100	26.57	100	26.61	100	Quartz alpha
27.47	13	27.49	21	27.43	20	27.48	18	Microcline (01-076-1238) Orthoclase
27.89	23	27.88	25	27.86	21	27.90	21	Albite
-	-	-	-	29.36	14	-	-	Microcline
-	-	-	-	29.79	15	-	-	Orthoclase
34.76	10	-	-	34.78	14	34.78	12	Muscovite 2M1
36.51	15	36.50	18	36.48	17	36.52	15	Quartz alpha
39.44	12	39.42	15	39.39	16	39.45	14	Quartz alpha
40.26	10	40.25	13	40.23	13	40.26	11	Quartz alpha
42.42	12	42.40	14	42.38	15	42.43	13	Quartz alpha
45.77	10	45.73	13	45.71	13	45.78	11	Quartz alpha
50.10	16	50.09	19	50.07	19	50.11	17	Quartz alpha
51.12	7	-	-	-	-	-	-	Albite
54.85	9	54.82	13	54.81	13	54.85	11	Quartz alpha
55.28	8	55.24	11	-	-	-	-	Quartz alpha
59.92	13	59.90	16	59.89	16	59.93	14	Quartz alpha
63.98	8	63.99	11	63.95	11	64.01	9	Quartz alpha