Catawba Ceramics

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BRUKER TEST RESULTS

Objective

The Catawba people are located along the border between North and South Caroline. The Native American Studies Center, associated with the University of South Carolina, Lancaster, curates both historic and pre-historic ceramics produced by the tribe over the past several centuries. The Center works with the Catawba people to collect clay samples (without location information preserved for privacy reasons) from clayholes. Typically the Catawba select clay from one of two clay types, the ‘red clays’ and the ‘blue clays’. As many of their ceramics are a mixture of these two, the goals of this project were to identify a signature that could be used to piece out the proportional contribution of each.

Method

Samples from Blue Clayhole sources (Clayhole Blue Blumer, Clayhole Blue BG, Clayhole Blue S3) and Red Clayholesources (Clayhole BG, Clayhole S2, Clayhole S3) were analyzed for both light and heavy elements. Data were taken using two sets of parameters:

Data set 1: 15 keV, 25 μA,, No Filter, Vacuum, 60 seconds
Data set 2: 40 keV, 10.7 μA, 1 mil Ti/12 mil Al Filter (Yellow), Dry Air, 60 seconds

Spectra were analyzed using Spectra software version 7.4.0.0 for qualitative analysis. Data were quantified using the quantification procedures outlined in Rowe et al. 2012.

RESULTS

Calcium, Manganese, Titanium, and Zirconium all had statistically significant differences between means for the Blue and Red Clays ($p < 0.01$), with the first two elements being more concentrated in Blue Clays and the last two elements being more concentrated in Red Clays.

Variation in ceramics produced by the Catawba fall between the two clay groups in Calcium, Manganese, and Zirconium concentrations. They do, however, have high Titanium concentrations relative to the clay samples, suggesting that the clay samples used in this study do not describe all variation

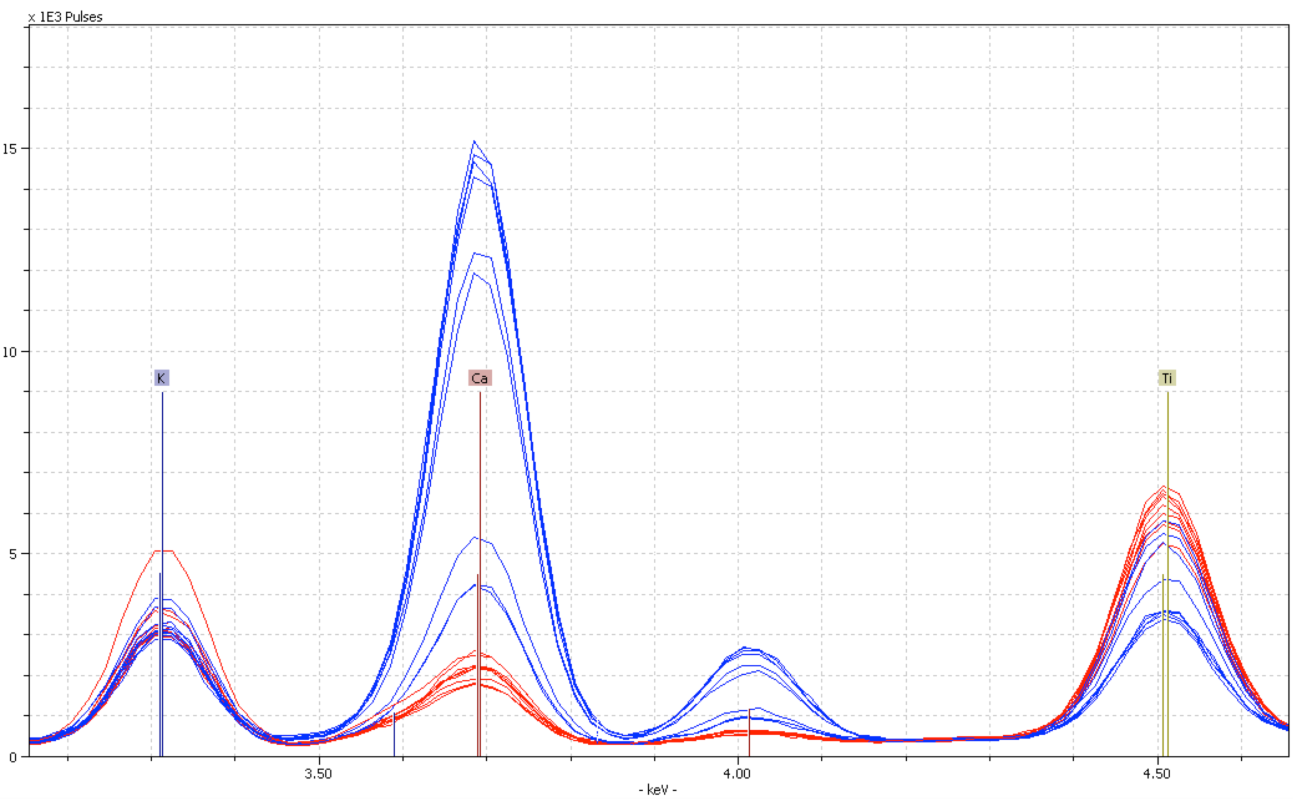

Figure 1: Spectral overlay of Blue and Red Clays, colored accordingly. Blue Clays have much higher Calcium (+1.93 weight %, $p < 0.01$), while Red Clays have higher Titanium (+0.22 weight %, $p < 0.001$).

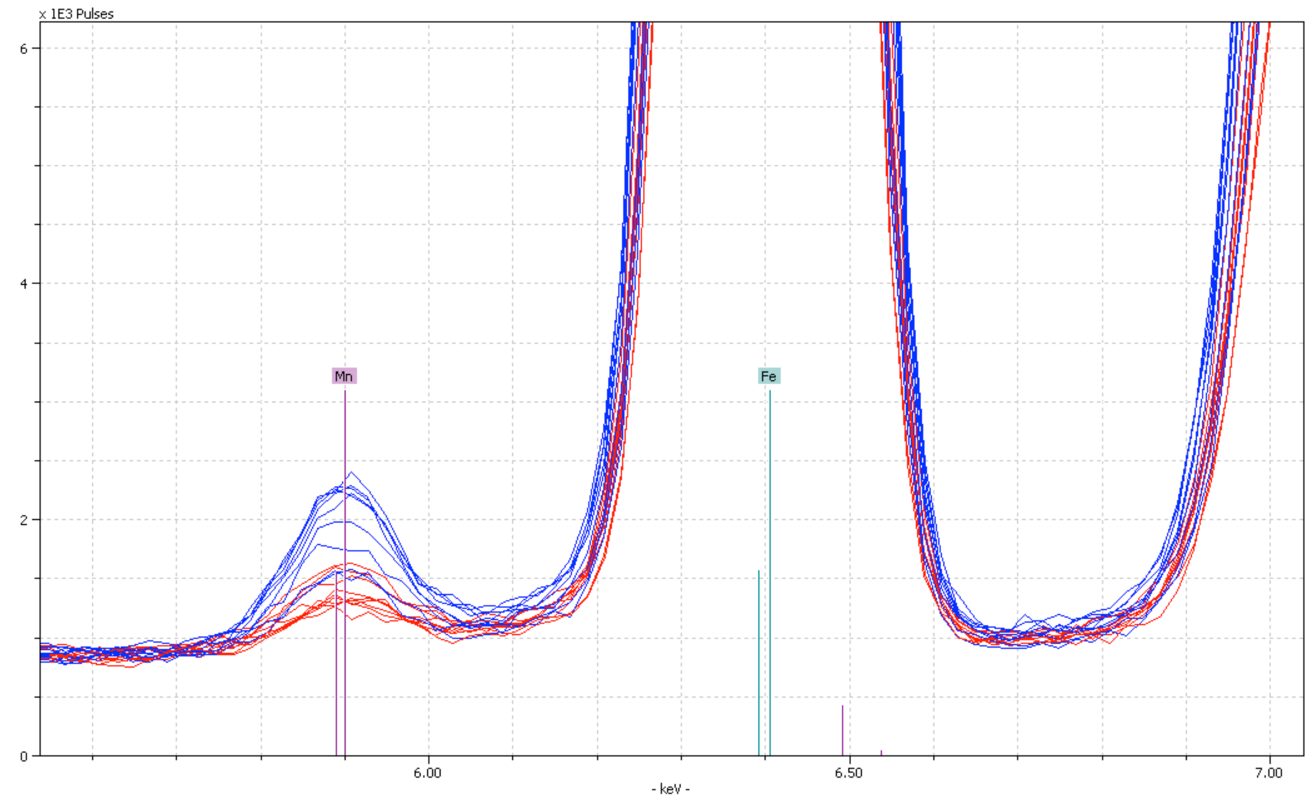

Figure 2: Spectral overlay of Blue and Red Clays, colored accordingly. Blue Clays have higher Manganese (+227 ppm, $p < 0.01$).

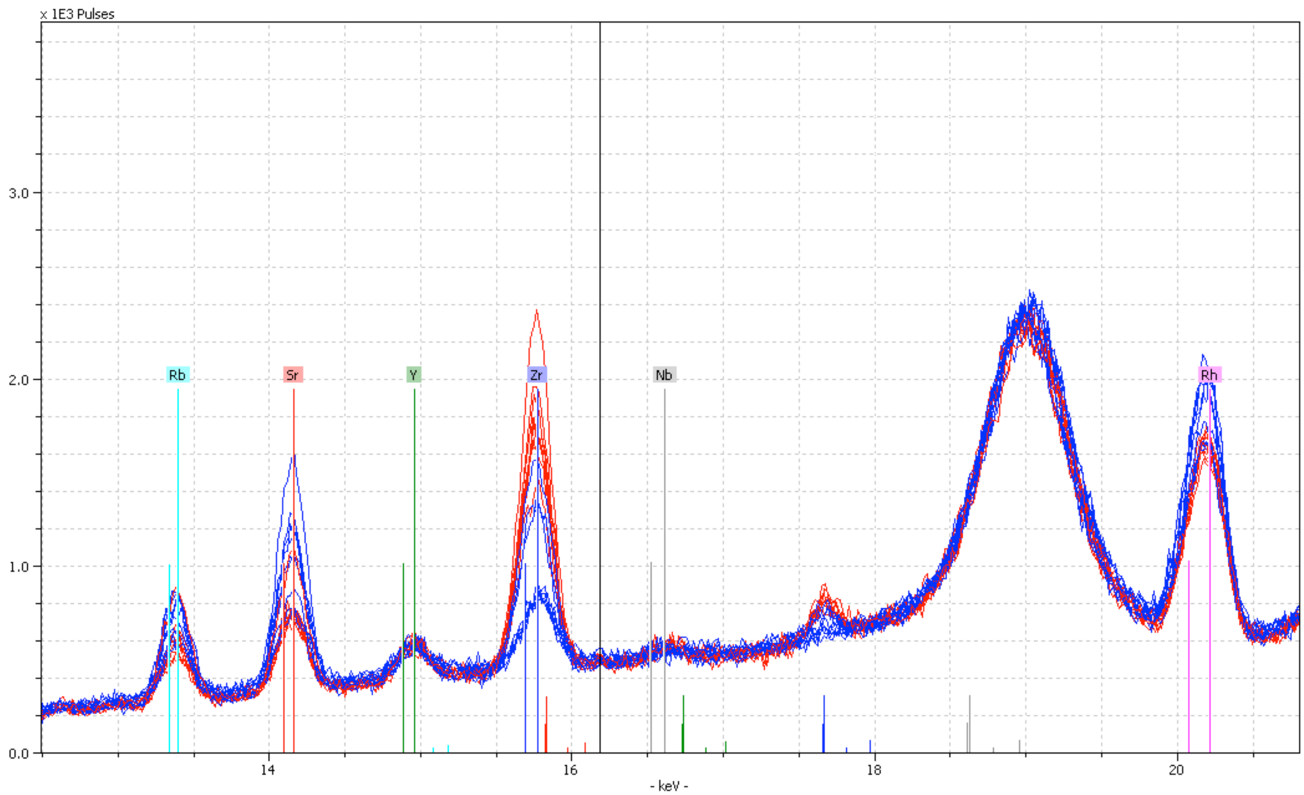

Figure 3: Spectral overlay of Blue and Red Clays, colored accordingly. Red Clays have higher Zirconium (+141 ppm, $p < 0.01$).

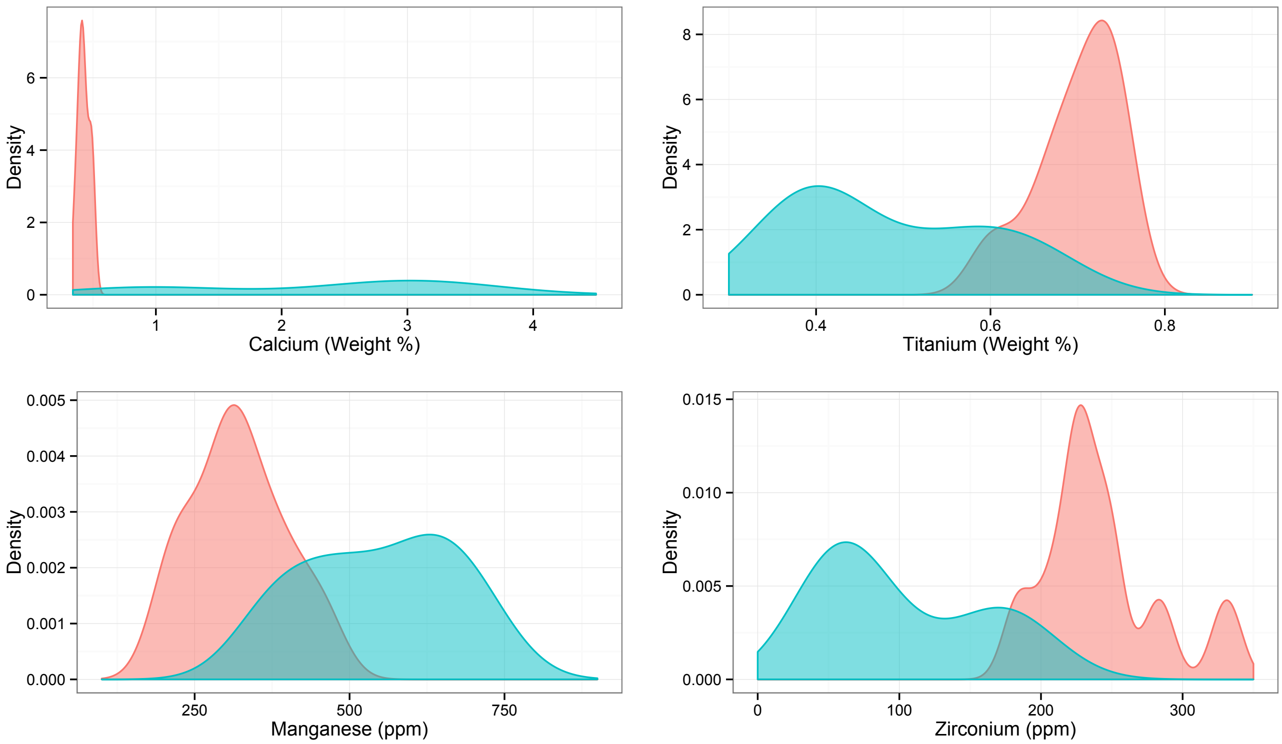

Figure 4: Kernel density plots for Calcium (top left), Titanium (top right), Manganese (bottom left), and Zirconium (bottom right). Each element shows a potentially identifiable difference between Red and Blue Clays, with Calcium being the most distinct.

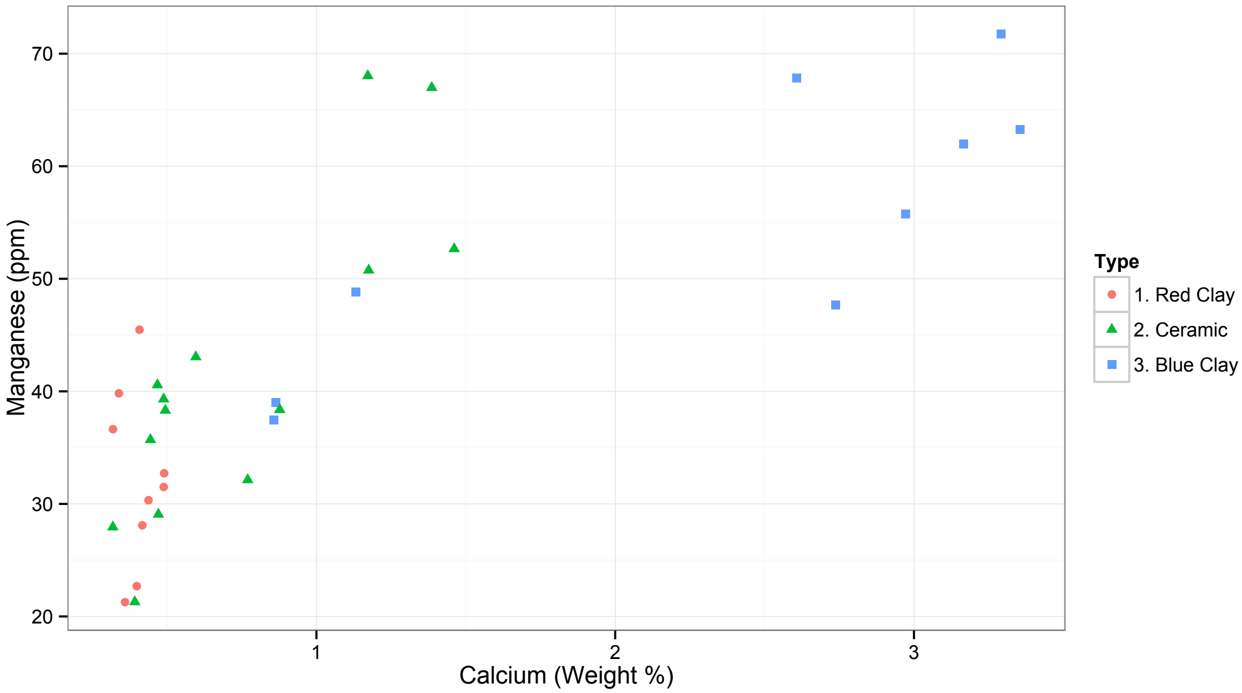

Figure 5: Bivariate plot of Calcium by Manganese. Red and Blue Clays differentiate from each other, while historical clay ceramics fall between the two, showing overlap with both the red and blue clays. This may help understand the proportional contribution of each type of clay to the final ceramics.

Type	Ca %	Ti %	Mn ppm	Fe %	Zr ppm
Blue Clay	0.86	0.57	373	3.50	161
Blue Clay	1.13	0.66	488	3.70	193
Blue Clay	0.86	0.62	389	3.78	170
Blue Clay	2.74	0.41	477	6.58	56
Blue Clay	3.36	0.52	633	6.80	59
Blue Clay	2.61	0.41	678	6.09	61
Blue Clay	3.17	0.39	620	6.82	61
Blue Clay	3.29	0.40	717	6.91	59
Blue Clay	2.97	0.35	558	6.61	55
Red clay	**0.42**	0.71	281	3.77	227
Red clay	0.44	0.69	303	3.23	226
Red clay	0.49	0.75	327	2.46	206
Red clay	0.34	0.65	398	3.87	283
Red clay	0.32	0.73	366	3.36	245
Red clay	0.41	0.74	455	3.06	250
Red clay	0.36	0.60	213	4.18	184
Red clay	0.40	0.68	227	4.35	227
Red clay	0.49	0.75	315	2.70	331

Table 1: Quantified results of Red and Blue Clays for select elements.