

UC Berkeley

Archaeological X-ray Fluorescence Reports

Title

An Energy-Dispersive X-Ray Fluorescence Analysis of Obsidian Artifacts from Four Sites in San Diego County, California

Permalink

<https://escholarship.org/uc/item/603005bp>

Author

Shackley, M. Steven

Publication Date

2006-05-11

Supplemental Material

<https://escholarship.org/uc/item/603005bp#supplemental>



Department of Anthropology
232 Kroeber Hall
University of California
Berkeley, CA 94720-3710

LETTER REPORT

AN ENERGY-DISPERSIVE X-RAY FLUORESCENCE ANALYSIS OF OBSIDIAN ARTIFACTS FROM FOUR SITES IN SAN DIEGO COUNTY, CALIFORNIA

11 May 2006

Andrew Pignuolo
Laguna Mountain Environmental
3849 Shasta Street, #16
San Diego, CA 92109

Dear Andy,

All the artifacts were produced from Obsidian Butte in Imperial County, California. Source determination was made using source standards at Berkeley (<http://www.swxrflab.net/obsbutte.htm>), and reference to Hughes (1986). Some of the samples were quite small, but the rather unique elemental concentrations particularly for yttrium and zirconium of this mildly peralkaline rhyolite, strongly suggests that provenance (Table 1; see Shackley 2005). The macroscopic character with its sanidine phenocrysts also supports that source assignment. While the sample sizes are small here, the proportion of Obsidian Butte obsidian in northern San Diego County sites (SDI-570 here) is not always this high (see Hughes and True 1985). I don't know if this has been empirically investigated since the Hughes and True paper, but the database must be more extensive by now.

The samples were analyzed using the Spectrace (Thermo) *QuanX* EDXRF spectrometer in the Archaeological XRF Laboratory, University of California, Berkeley. Instrumental methods can be found at <http://www.swxrflab.net/analysis.htm>. Analysis of the USGS RGM-1 standard indicates high machine precision for the elements of interest (Govindaraju 1994; Table 1 here).

Sincerely,

M. Steven Shackley
Professor and Director

VOICE: (510) 642-2533
INTERNET: shackley@berkeley.edu
<http://www.swxrflab.net/>

REFERENCES CITED

- Davis, M.K., T.L. Jackson, M.S. Shackley, T. Teague, and J.H. Hampel
 1998 Factors Affecting the Energy-Dispersive X-Ray Fluorescence (EDXRF) Analysis of Archaeological Obsidian. In *Archaeological Obsidian Studies: Method and Theory*, edited by M.S. Shackley, pp. 159-180. Advances in Archaeological and Museum Science 3. Springer Academic/Plenum Press, New York.
- Govindaraju, K.
 1994 1994 Compilation of Working Values and Sample Description for 383 Geostandards. *Geostandards Newsletter* 18 (special issue).
- Hughes, R.E.
 1986 Trace Element Composition of Obsidian Butte, Imperial County, California. *Southern California Academy of Sciences Bulletin* 85:35-45.
- Hughes, Richard E., and Delbert L. True
 1985 Perspectives on the Distribution of Obsidians in San Diego County, California. *North American Archaeologist* 6(4):325-339.
- Shackley, M. S.
 2005 *Obsidian: Geology and Archaeology in the North American Southwest*. University of Arizona Press, Tucson.

Table 1. Elemental (Ti-Nb) concentrations in parts per million (ppm) and peak height (Fe K α and Mn K α) and Fe:Mn ratios for the archaeological specimens.

Site/Sample	Ti	Mn	Fe	Rb	Sr	Y	Zr	N b	Fe K α	Mn K α	Fe:Mn	Source
17530-13	132	34	1577	13	32	11	32	24	238.1	2.7	88.2	Obsidian Butte, CA
	5	9	6	7		6	2					
17528-57	141	41	1584	12	33	11	32	16	140.8	2.0	70.4	Obsidian Butte, CA
	2	0	8	4		6	3					
17528-98	131	41	1349	11	34	11	27	42	121.8	2.1	58.0	Obsidian Butte, CA*
	2	7	0	9		2	3					
17528-112A	128	35	1510	13	23	11	28	22	92.4	1.1	84.0	Obsidian Butte, CA*
	8	7	6	4		6	7					
17528-112B	158	55	2050	13	39	11	32	23	114.2	1.7	67.2	Obsidian Butte, CA*
	8	1	0	9		5	4					
17528-192	146	47	1542	12	34	10	26	27	95.0	1.7	55.9	Obsidian Butte, CA*
	9	7	9	6		7	5					
17140-107	123	41	1719	13	33	11	33	26	191.1	2.5	76.4	Obsidian Butte, CA
	9	7	3	0		2	6					
17140-550	158	40	1824	13	23	10	32	46	101.5	1.2	84.6	Obsidian Butte, CA*
	1	8	8	0		1	1					
570-31	172	47	1960	13	35	11	35	22	134.2	1.8	74.6	Obsidian Butte, CA
	8	4	4	3		4	9					
570-53	152	42	1776	12	44	10	35	30	181.5	2.3	78.9	Obsidian Butte, CA
	0	5	3	6		7	6					
570-75A	156	49	1931	14	31	13	32	32	165.0	2.3	71.7	Obsidian Butte, CA
	6	5	9	3		0	6					
570-75B	154	49	1760	12	29	11	31	12	108.7	1.7	63.9	Obsidian Butte, CA
	3	3	3	9		6	2					
570-113	152	38	1467	11	32	94	25	32	59.2	0.8	74.0	Obsidian Butte, CA*
	6	5	0	4			9					

570-303	140	45	1663	13	35	12	30	14	156.7	2.3	68.1	Obsidian Butte, CA
	5	0	0	2		0	5					
RGM1-S3	161	30	1298	15	11	20	21	4	n/a	n/a	n/a	standard
	9	2	7	3	4		6					

* Most of the samples were small enough that the elemental concentrations are just outside the source standard data for Obsidian Butte as discussed in the text (see Davis et al. 1998). Those noted by * are particularly so.