

An IBA multivariate-driven provenance investigation of ancient lapis lazuli amulets from the Museo Egizio (Turin, Italy)

EPJ+

Marta Magalini^{a,b} & Laura Guidorzi^{a,b}, Alessandro Re^{a,b}, Nicole Manfredda^{a,c}, Martina Terzoli^d, Valentina Turina^d, Quentin Lemasson^{e,f}, Laurent Pichon^{e,f}, Brice Moignard^{e,f}, Claire Pacheco^{e,f}, Alessandro Lo Giudice^{a,b}

^a Dipartimento di Fisica, Università di Torino, Via Pietro Giuria 1, Turin, Italy

^b INFN Sezione di Torino, Via Pietro Giuria 1, Turin, Italy

^c Dipartimento di scienze dell'antichità, Università di Roma "La Sapienza", piazzale Aldo Moro 5, Roma, Italy

^d Dipartimento Collezione e Ricerca, Museo Egizio, Turin, Italy

^e Centre de Recherche et de Restauration des Musées de France, C2RMF, 14 quai François Mitterrand, Paris, France

^f UAR 3506 Lab-BC, 14 quai François Mitterrand, Paris, France

Corresponding author: Alessandro Lo Giudice- alessandro.logiudice@unito.it

μ-PIXE results of calcite crystals analysis in the Egyptian amulets

μ-PIXE calcite data of the Egyptian amulets acquired at the New AGLAE facility. Concentration values and associated errors are reported, together with the relative limit of detection (LOD). K=concentration obtained from the analysis of the K line X-ray peak. L=concentration obtained from the analysis of the L line X-ray peak. - = element cannot be detected.

Sample	Area	NaK			MgK			AlK			SiK		
		conc (ppm)	err (ppm)	LOD (ppm)	conc (ppm)	err (ppm)	LOD (ppm)	conc (ppm)	err (ppm)	LOD (ppm)	conc (ppm)	err (ppm)	LOD (ppm)
2926	C1	6000	1000	2000	10000	1000	1000	7800	700	600	13400	600	500
2926	C2	3000	2000	3000	17000	1000	1000	9000	1000	800	28000	1000	300
3039	C1	2900	1200	2000	2200	500	900	3300	400	600	7400	400	400
Sample	Area	P K			S K			ClK			K K		
		conc (ppm)	err (ppm)	LOD (ppm)	conc (ppm)	err (ppm)	LOD (ppm)	conc (ppm)	err (ppm)	LOD (ppm)	conc (ppm)	err (ppm)	LOD (ppm)
2926	C1	1900	400	700	600	200	400	1700	200	200	900	200	200
2926	C2	1400	700	1000	700	300	500	800	200	300	600	200	300
3039	C1	-	-	1000	2800	200	300	2500	200	200	2500	200	200
Sample	Area	CaK			TiK			V K			CrK		
		conc (ppm)	err (ppm)	LOD (ppm)	conc (ppm)	err (ppm)	LOD (ppm)	conc (ppm)	err (ppm)	LOD (ppm)	conc (ppm)	err (ppm)	LOD (ppm)
2926	C1	375000	2000	600	430	40	50	-	-	80	-	-	50
2926	C2	368000	3000	700	500	60	70	-	-	60	-	-	60
3039	C1	387000	2000	400	550	40	40	48	19	40	1	20	20
Sample	Area	MnK			FeK			CoK			NiK		
		conc (ppm)	err (ppm)	LOD (ppm)	conc (ppm)	err (ppm)	LOD (ppm)	conc (ppm)	err (ppm)	LOD (ppm)	conc (ppm)	err (ppm)	LOD (ppm)

2926	C1	1450	40	20	1370	40	30	6	15	30	250	50	300
2926	C2	1390	50	19	1680	50	40	-	-	80	450	70	400
3039	C1	208	14	17	2010	30	12	16	16	30	560	40	200
		CuK			ZnK			GaK			AsK		
Sample	Area	<i>conc (ppm)</i>	<i>err (ppm)</i>	<i>LOD (ppm)</i>	<i>conc (ppm)</i>	<i>err (ppm)</i>	<i>LOD (ppm)</i>	<i>conc (ppm)</i>	<i>err (ppm)</i>	<i>LOD (ppm)</i>	<i>conc (ppm)</i>	<i>err (ppm)</i>	<i>LOD (ppm)</i>
2926	C1	60	20	50	79	13	12	-	-	30	230	40	100
2926	C2	90	30	80	61	19	20	15	16	20	90	60	100
3039	C1	480	20	40	124	14	14	-	-	20	60	20	30
		SrK			Y K			ZrK			Pb L		
Sample	Area	<i>conc (ppm)</i>	<i>err (ppm)</i>	<i>LOD (ppm)</i>	<i>conc (ppm)</i>	<i>err (ppm)</i>	<i>LOD (ppm)</i>	<i>conc (ppm)</i>	<i>err (ppm)</i>	<i>LOD (ppm)</i>	<i>conc (ppm)</i>	<i>err (ppm)</i>	<i>LOD (ppm)</i>
2926	C1	1800	100	80	180	80	100	200	100	300	1800	200	100
2926	C2	1600	200	100	200	100	100	500	200	300	1600	200	100
3039	C1	500	100	40	-	-	80	50	50	100	240	60	80