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Possibilities and limitations of macroscopic determination of pottery fabrics in the field

Various proposals were made to describe pottery fabrics in the field and there is much experience of archaeologists working in different regions and periods. However, later archaeometric analysis in many instances show large discrepancies and the fabric groups can not be confirmed. Later correction of the initial pottery classification in some cases is impossible. This is true when thousands of sherds can not be re-examined or when only few samples can be taken out of the country. Then detailed documentation in the field is essential.

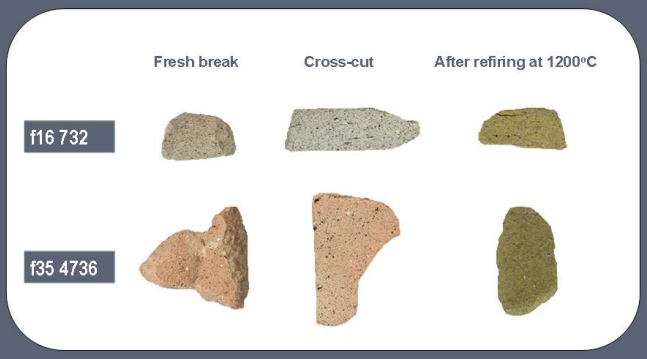
Modern digital cameras offer a cheep and quick possibility to take a photo of a fresh break. This could be practically made with thousands of sherds. Later, thin sections studies, refiring (MGR-analysis) and chemical analysis could be made on a few selected sherds and correlated to the appearance in the fabric photo. This is tested using examples based on 500 sherds from Neolithic to Islamic periods collected during archaeological field surveys in Oman and analysed in the laboratories in Berlin and Warsaw (project was supported by DFG). For the laboratory analysis a down-up sampling strategy was used starting with 500 MGR-analyses, followed by selecting 70 samples for chemical analyses by WD-XRF and 52 samples for thin section study.

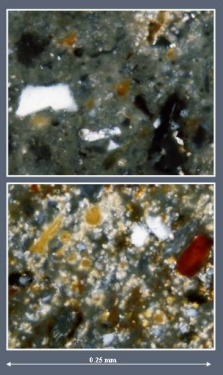
SIMILARITIES

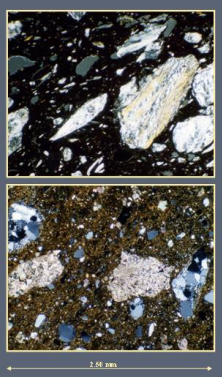
Several fabrics (43%) are perfectly classified but some fabrics after chemical analysis must be classified together.

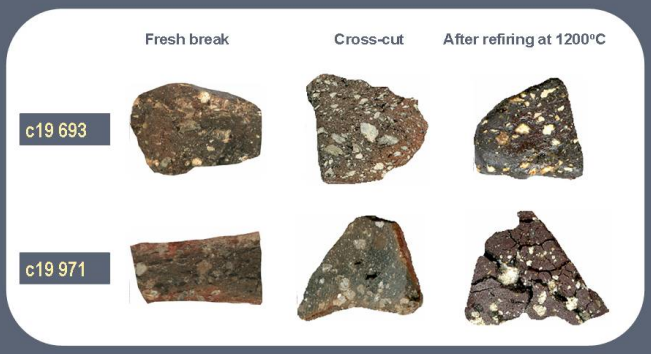
Chemical analysis by WD-XRF

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	V	Cr	Ni	(Cu)	Zn	Rb	Sr	Y	Zr	(Nb)	Ba	(La	Ce	Pb	Th	LOI	TOTAL
	% by weight										ppm															%	%
f16 732	49.99	0.73	14.80	6.50	0.084	6.07	19.04	0.63	2.04	0.16	109	349	134	290	64	82	532	24	158	18	251	40	77	1009	33	2.94	99.26
f35 4736	51.25	0.75	14.92	5.99	0.093	4.95	19.22	0.91	1.83	0.11	101	310	136	71	58	72	503	23	172	17	515	43	60	327	26	6.59	99.45









DIFFERENCES

Samples taken to represent the same initial fabric but showing significant differences in composition may be re-classified when sufficient documentation as e.g. a photographic image of the fresh break is available.

Chemical analysis by WD-XRF

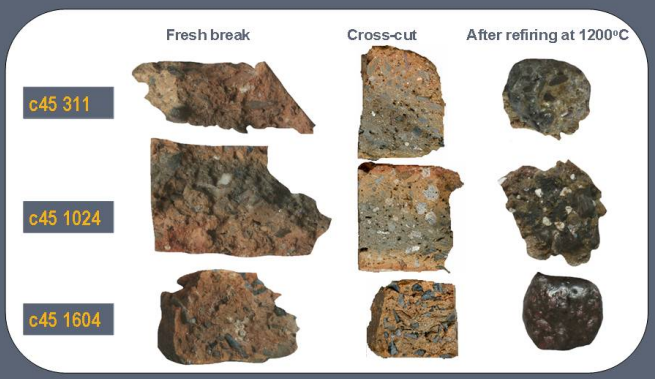
	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	V	Cr	Ni	(Cu)	Zn	Rb	Sr	Y	Zr	(Nb)	Ba	(La	Ce	Pb	Th	LOI	TOTAL
	% by weight										ppm															%	%
c19 693	59.98	0.67	13.63	5.46	0.037	14.02	3.00	0.25	2.02	0.15	94	107	76	68	75	71	84	169	19	111	16	189	19	48	15	22	2.10	99.54
c19 971	48.66	1.10	20.66	9.86	0.105	3.96	13.75	0.24	1.70	0.09	281	742	330		84	114	64	263	37	262	20	591	32	80	26	31	11.15	99.80

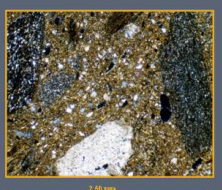
PROBLEMS

Samples taken as examples of the same fabrics but significantly differing in composition turned out to be so similar in their macroscopically appearance that their true classification in the field seems impossible.

Chemical analysis by WD-XRF

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	V	Cr	Ni	(Cu)	Zn	Rb	Sr	Y	Zr	(Nb)	Ba	(La	Ce	Pb	Th	LOI	TOTAL
	% by weight										ppm															%	%
c45 311	50.91	0.82	15.63	7.17	0.097	3.95	18.15	0.76	2.37	0.14	127	528	198	50	102	93	275	30	188	16	869	18	77	20	19	14.25	100.50
c45 1024	46.19	0.77	14.96	6.82	0.072	3.71	24.23	0.44	2.55	0.25	156	496	146	72	109	84	293	26	181	16	1011	42	62	25	29	16.49	99.13
c45 1604	65.79	0.82	15.97	7.22	0.067	4.69	2.26	0.77	2.31	0.11	131	381	280	33	86	91	260	28	185	17	362	41	71	33	<10	1.74	101.00





The macrophotos of fresh breaks and cross sections, before and after refiring at 1200°C, were done with a Canon camera EOS 350 and a 60 mm – macroobjective

We would like to thank Dr. Jutta Haeser for placing the material at our disposal in frame of a DFG-project.

OPEN QUESTIONS

- How to avoid macroscopical misclassification?
- Which simple laboratory techniques may be used in the field?
- To which degree helps digital registration of macroscopic appearances followed by laboratory analyses of selected sherds?