A new FTIR method for estimating the firing temperature of ceramic bronze-casting moulds from early China

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Supplementary Information

Supplementary Table S1. Mineralogical composition of two mould samples.

All phases				
Sample	**Quartz**	**Albite**	**Microcline**	**Clay**
H315②:57-30	57%	20%	9%	14%
H315:58-5	46%	27%	12%	15%

Clay minerals						
Sample	**Clay mineral composition**					**Mixed-layer ratio (S%)**
	It/S	**It**	**Kao**	**It/V**	**Pa**	**It/S**
H315②:57-30	72%	25%	3%	-	-	40%
H315:58-5	52%	40%	5%	2%	1%	40%

It: Illite; Kao: Kaolinite; V: Vermiculite; Pa: Palygorskite; S: Smectite

Supplementary Table S2. Chemical composition of all mould and core samples.

Sample	Type	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	FeO
H315③:75-6	mould	1.6	1.0	12.3	75.3	2.2	2.1	4.5
H315③:75-2	mould	1.7	1.1	13.2	74.9	2.9	1.5	4.4
H315:20-6	mould	1.1	Bdl	12.3	74.6	2.2	2.5	6.3
H315:69-0	mould	2.1	1.4	13.4	72.1	3.6	2.1	5.0
H315:69-24	mould	2.0	1.1	12.5	73.4	3.0	3.4	4.3
H315:69-5	mould	1.7	1.1	14.9	73.4	3.5	1.1	3.8
H315:58-5	mould	2.0	1.1	15.7	71.2	3.6	1.4	4.7
H315:58-7	mould	1.9	1.2	14.5	73.1	3.3	1.4	4.3
H315②:57-30	mould	1.7	0.9	11.3	75.1	1.7	2.7	4.3
H315②:57-30-2	mould	2.0	1.0	16.0	72.4	3.1	1.1	3.7
Average of moulds		1.8	1.1	13.6	73.6	2.91	1.9	4.5
H315:18-19	core	1.0	Bdl	10.3	80.6	2.2	1.2	4.7
H315:7	core	2.1	Bdl	13.2	75.6	2.7	1.4	4.5
H315:18-23	core	1.7	Bdl	10.7	80.8	2.5	1.3	2.8
H315:4-6	core	2.2	1.0	13.7	74.7	2.9	1.6	3.5
Average of cores		1.8	0.3	12.0	77.9	2.6	1.4	3.9

Supplementary Table S3. Estimated firing temperature ranges for all mould and core samples.

Sample	Type	FTIR qualitative analysis		FTIR quantitative analysis (Absorptivity Ratio Method)			
		Observed FTIR absorption bands (cm^{-1})	Firing temperature (ºC)	Average absorptivity ratio (a_S/a_{IS})	Coefficient of variation	Firing temperature (ºC)	Estimation approach
H315:69-24	mould	3624, 1035, 520	＜500	0.5616	8.33%	200-300	CCA
H315:58-5	mould	3624, 1035, 520	＜500	0.5614	2.12%	200-300	CCA
H315:69-5	mould	3624, 1035, 520	＜500	0.5411	2.76%	200-300	CCA
H315:58-7	mould	3624, 1035, 520	＜500	0.5344	0.27%	200-300	RA
H315②:57-30-2	mould	3624, 1035, 520	＜500	0.5139	3.96%	200-300	RA
H315③:75-2	mould	3624, 1035, 520	＜500	0.5133	4.36%	200-300	CCA
H315③:75-6	mould	3624, 1035, 520	＜500	0.5073	2.39%	200-300	CCA
H315②:57-30	mould	3624, 1035, 520	＜500	0.4373	1.13%	300-400	RA
H315:69-0	mould	3624, 1035, 520	＜500	0.4362	2.96%	300-400	CCA
H315:20-6	mould	3624, 1035, 520	＜500	0.4262	3.64%	300-400	CCA
H315:18-23	core	3624, 1035, 520	＜500	0.3934	1.19%	200-300	RA
H315:4-6	core	1078, 1035	500-700	0.3307	5.91%	500-600	RA
H315:18-19	core	1078, 1035	500-700	0.3268	3.58%	500-600	RA
H315:7	core	1078	500-700	0.3259	1.32%	500-600	CCA

Supplementary Figure S1. All bronze-casting mould and core artifacts analyzed in this study.