

# Quantitative Study on Colour and Spectral Characteristics of Beihong Agate

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**Table S1.** The colour parameters of twenty-four samples.

	<i>L</i> <sup>*</sup>	<i>a</i> <sup>*</sup>	<i>b</i> <sup>*</sup>	<i>C</i> <sup>*</sup>	<i>h</i> <sup>°</sup>
BH-F-1	63.78	0.94	12.25	12.29	85.61
BH-F-2	60.86	2.57	33.81	33.91	85.65
BH-F-3	54.54	4.42	35.21	35.49	82.84
BH-F-4	64.17	3.77	46.48	46.63	85.36
BH-F-5	54.37	7.00	37.13	37.78	79.32
BH-F-6	56.09	10.76	50.38	51.52	77.94
BH-F-7	52.94	8.99	45.51	46.39	78.83
BH-F-8	47.88	17.54	52.10	54.97	71.39
BH-F-9	54.57	17.46	55.94	58.60	72.67
BH-F-10	47.93	21.17	57.25	61.04	69.71
BH-F-11	40.19	19.12	39.36	43.76	64.09
BH-F-12	38.98	19.83	37.82	42.70	62.33
BH-F-13	42.45	25.94	48.17	54.71	61.70
BH-F-14	44.22	15.77	50.59	52.99	72.69
BH-F-15	39.43	22.80	44.67	50.15	62.96
BH-F-16	32.74	23.42	36.79	43.61	57.52
BH-F-17	35.05	29.38	48.82	56.98	58.96
BH-F-18	32.54	32.48	39.65	51.25	50.68
BH-F-19	36.93	31.14	47.83	57.07	56.93
BH-F-20	27.77	29.54	32.98	44.28	48.15
BH-F-21	28.20	31.57	31.52	44.61	44.95
BH-F-22	28.46	30.34	28.85	41.87	43.56
BH-F-23	25.92	30.89	32.72	45.00	46.65
BH-F-24	23.56	29.73	25.62	39.25	40.75

**Table S2.** The results of XRF (wt %).

Sample	SiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	Cr <sub>2</sub> O <sub>3</sub>	CuO	K <sub>2</sub> O	V <sub>2</sub> O <sub>5</sub>	Sm <sub>2</sub> O <sub>3</sub>	Sum
BH-F-1	99.898	0.035		0.007			0.059	100
BH-F-2	99.929	0.038	0.024	0.009				100
BH-F-3	99.881	0.041		0.012	0.056	0.009		100
BH-F-4	99.943	0.035		0.012		0.010		100
BH-F-5	99.949	0.040		0.011				100
BH-F-6	99.939	0.052		0.009				100
BH-F-7	99.810	0.052		0.024	0.089	0.025		100
BH-F-8	99.904	0.047		0.010	0.040			100

BH-F-9	99.839	0.052	0.027	0.010	0.073	100	
BH-F-10	99.909	0.062		0.015	0.014	100	
BH-F-11	99.883	0.064		0.013	0.012	0.027	100
BH-F-12	99.870	0.089		0.009	0.032	100	
BH-F-13	99.908	0.084		0.008		100	
BH-F-14	99.900	0.058		0.018	0.024	100	
BH-F-15	99.926	0.062		0.012		100	
BH-F-16	99.868	0.078		0.008	0.046	100	
BH-F-17	99.894	0.079		0.017	0.010	100	
BH-F-18	99.842	0.088		0.015	0.012	0.043	100
BH-F-19	99.842	0.081		0.008	0.069	100	
BH-F-20	99.905	0.087		0.008		100	
BH-F-21	99.889	0.100		0.010		100	
BH-F-22	99.888	0.104		0.007		100	
BH-F-23	99.913	0.078		0.009		100	
BH-F-24	99.850	0.118	0.022	0.010		100	

**Table S3.** Moganite content and Raman band integral ratio  $I_{(502)}/I_{(465)}$  in samples with different total Fe contents and hue angles.

<b>Sample</b>	<b><math>I_{(502)}/I_{(465)}</math></b>	<b>Moganite(wt.-%)</b>	<b><math>w(\text{Fe}_2\text{O}_3)\%</math></b>	<b><math>h^\circ</math></b>
<b>BH-F-1</b>	0.321	63.407	0.035	85.612
<b>BH-F-2</b>	0.324	63.628	0.038	85.653
<b>BH-F-4</b>	0.357	65.868	0.035	85.363
<b>BH-F-6</b>	0.322	63.476	0.052	77.944
<b>BH-F-8</b>	0.331	64.102	0.047	71.394
<b>BH-F-10</b>	0.316	63.040	0.062	69.707
<b>BH-F-12</b>	0.264	58.750	0.089	62.331
<b>BH-F-14</b>	0.314	62.896	0.058	72.687
<b>BH-F-16</b>	0.287	60.747	0.078	57.520
<b>BH-F-18</b>	0.275	59.744	0.088	50.677
<b>BH-F-20</b>	0.291	61.131	0.087	48.149
<b>BH-F-22</b>	0.274	59.715	0.104	43.558

**Table S4.** Relationships between the position of the primary trough within the range of 500-600 nm and the total Fe content and colour parameters.

<b>sample</b>	<b>The position of primary trough</b>	<b><math>L^*</math></b>	<b><math>C^*</math></b>	<b><math>h^\circ</math></b>	<b><math>w(\text{Fe}_2\text{O}_3)\%</math></b>
<b>BH-F-1</b>		63.78	12.29	85.61	0.035
<b>BH-F-2</b>	504	60.86	33.91	85.65	0.038
<b>BH-F-3</b>	502	54.54	35.49	82.84	0.041
<b>BH-F-4</b>	503	64.17	46.63	85.36	0.035
<b>BH-F-5</b>	514	54.37	37.78	79.32	0.040
<b>BH-F-6</b>	511	56.09	51.52	77.94	0.052
<b>BH-F-7</b>	511	52.94	46.39	78.83	0.052
<b>BH-F-8</b>	528	47.88	54.97	71.39	0.047
<b>BH-F-9</b>	522	54.57	58.60	72.67	0.052
<b>BH-F-10</b>	533	47.93	61.04	69.71	0.062
<b>BH-F-11</b>	532	40.19	43.76	64.09	0.064
<b>BH-F-12</b>	540	38.98	42.70	62.33	0.089
<b>BH-F-13</b>	540	42.45	54.71	61.70	0.084

<b>BH-F-14</b>	528	44.22	52.99	72.69	0.058
<b>BH-F-15</b>	538	39.43	50.15	62.96	0.062
<b>BH-F-16</b>	540	32.74	43.61	57.52	0.078
<b>BH-F-17</b>	548	35.05	56.98	58.96	0.079
<b>BH-F-18</b>	563	32.54	51.25	50.68	0.088
<b>BH-F-19</b>	575	36.93	57.07	56.93	0.081
<b>BH-F-20</b>	580	27.77	44.28	48.15	0.087
<b>BH-F-21</b>	579	28.20	44.61	44.95	0.100
<b>BH-F-22</b>	581	28.46	41.87	43.56	0.104
<b>BH-F-23</b>	582	25.92	45.00	46.65	0.078
<b>BH-F-24</b>	585	23.56	39.25	40.75	0.118

**Table S5.** Colour parameters and colour difference before and after teat treatment.

	24°C					310°C					$\Delta E_{00}$
	$L^*$	$a^*$	$b^*$	$C^*$	$h^\circ$	$L^*$	$a^*$	$b^*$	$C^*$	$h^\circ$	
<b>BH-F-1</b>	63.78	0.94	12.25	12.29	85.61	70.63	0.50	11.71	11.72	87.53	5.52
<b>BH-F-2</b>	60.86	2.57	33.81	33.91	85.65	51.62	20.24	46.32	50.55	66.39	14.48
<b>BH-F-3</b>	54.54	4.42	35.21	35.49	82.84	50.24	19.87	47.49	51.48	67.30	10.82
<b>BH-F-4</b>	64.17	3.77	46.48	46.63	85.36	55.74	21.10	58.26	61.96	70.09	13.01
<b>BH-F-5</b>	54.37	7.00	37.13	37.78	79.32	43.17	26.05	42.83	50.13	58.70	16.11
<b>BH-F-6</b>	56.09	10.76	50.38	51.52	77.94	50.90	22.99	54.89	59.51	67.28	8.76
<b>BH-F-7</b>	52.94	8.99	45.51	46.39	78.83	42.49	30.34	47.70	56.53	57.54	16.42
<b>BH-F-8</b>	47.88	17.54	52.10	54.97	71.39	34.08	36.40	40.39	54.37	47.97	18.01
<b>BH-F-9</b>	54.57	17.46	55.94	58.60	72.67	37.51	35.91	45.54	58.00	51.74	20.66
<b>BH-F-10</b>	47.93	21.17	57.25	61.04	69.71	32.23	38.28	39.21	54.79	45.69	19.49
<b>BH-F-11</b>	40.19	19.12	39.36	43.76	64.09	22.34	25.97	20.18	32.88	37.85	18.17
<b>BH-F-12</b>	38.98	19.83	37.82	42.70	62.33	17.83	14.58	9.41	17.35	32.85	21.41
<b>BH-F-13</b>	42.45	25.94	48.17	54.71	61.70	21.39	28.20	21.83	35.66	37.74	20.78
<b>BH-F-14</b>	44.22	15.77	50.59	52.99	72.69	40.89	38.67	54.20	66.58	54.49	12.15
<b>BH-F-15</b>	39.43	22.80	44.67	50.15	62.96	22.21	27.47	22.99	35.82	39.93	17.59
<b>BH-F-16</b>	32.74	23.42	36.79	43.61	57.52	20.10	20.50	10.64	23.10	27.43	16.15
<b>BH-F-17</b>	35.05	29.38	48.82	56.98	58.96	19.64	29.18	24.53	38.12	40.05	15.68
<b>BH-F-18</b>	32.54	32.48	39.65	51.25	50.68	17.91	29.88	19.63	35.75	33.30	13.96
<b>BH-F-19</b>	36.93	31.14	47.83	57.07	56.93	22.08	32.70	24.09	40.62	36.39	15.70
<b>BH-F-20</b>	27.77	29.54	32.98	44.28	48.15	18.19	31.40	18.84	36.62	30.97	10.07
<b>BH-F-21</b>	28.20	31.57	31.52	44.61	44.95	14.00	23.12	14.10	27.09	31.38	12.95
<b>BH-F-22</b>	28.46	30.34	28.85	41.87	43.56	16.70	30.77	18.51	35.91	31.04	9.91
<b>BH-F-23</b>	25.92	30.89	32.72	45.00	46.65	12.12	21.80	12.85	25.30	30.52	13.40
<b>BH-F-24</b>	23.56	29.73	25.62	39.25	40.75	10.89	17.47	9.58	19.93	28.73	12.46