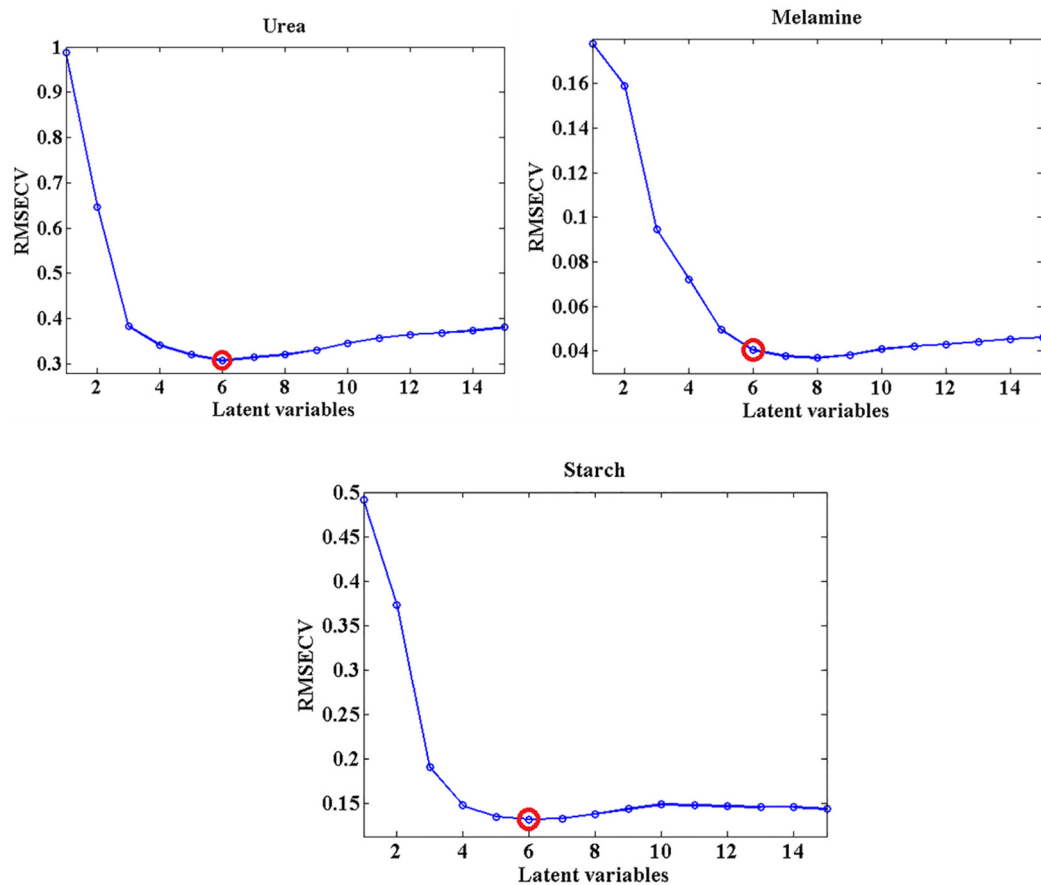Performance of the PLSR models for single adulterant samples using different pretreatment methods based on the full spectral range was shown in Table S1. For urea adulteration, compared with other pretreatments, model based on NOR presented the lowest RMSEP, the 3rd smallest RMSECV, and the 2nd smallest RMSEC. After comprehensive consideration, NOR was the best pretreatment. For melamine adulteration, NOR pretreatment presented similar performance with SNV, but with less number of LVs. Besides, to simplify pretreatment procedure, NOR was also chosen as the optimal pretreatment, the same as urea adulteration condition. For starch adulteration, comparison was clear. Model based on MAS presented the lowest RMSEP, RMSECV, and RMSEC. Hence, MAS was selected as the best pretreatment.

Table S1 Performance of the PLSR models for single adulterant samples using different pretreatment methods based on the full spectral range.

Adulterant	Pretreatment method	LVs	Calibration		Cross-validation		Prediction	
			R_c^2	RMSEC(%)	R_{cv}^2	RMSECV(%)	R_p^2	RMSEP(%)
urea	NON	7	0.995	0.255	0.992	0.320	0.990	0.350
	MAS	6	0.996	0.224	0.993	0.302	0.992	0.327
	NOR	6	0.996	0.218	0.993	0.307	0.992	0.321
	SNV	5	0.995	0.257	0.993	0.309	0.991	0.341
	SGS	6	0.996	0.226	0.993	0.295	0.991	0.340
	SGD1	7	0.997	0.197	0.981	0.491	0.978	0.542
melamine	NON	9	1.000	0.026	1.000	0.052	1.000	0.058
	MAS	9	1.000	0.030	1.000	0.049	1.000	0.050
	NOR	6	1.000	0.028	1.000	0.040	1.000	0.042
	SNV	7	1.000	0.023	1.000	0.038	1.000	0.039
	SGS	6	1.000	0.026	1.000	0.048	1.000	0.051
	SGD1	8	1.000	0.029	1.000	0.117	1.000	0.119
starch	NON	7	1.000	0.110	1.000	0.159	1.000	0.188
	MAS	6	1.000	0.093	1.000	0.132	1.000	0.139
	NOR	7	1.000	0.099	1.000	0.165	0.992	0.321
	SNV	5	1.000	0.102	1.000	0.133	1.000	0.153
	SGS	7	1.000	0.105	1.000	0.157	1.000	0.163
	SGD1	4	1.000	0.237	0.999	0.344	0.999	0.348

Figure S1 visualized the process of selecting LVs numbers in full spectral models with the best pretreatments for the three adulterants.

Figure S1 The optimal number of LVs determination in full spectral models with the best pretreatment for urea (a), melamine (b) and starch (c)