OPTOSKY Spectroscopy Solutions

NY6000

Edible Oil Raman Detection System NY6000

Features

- **One machine with multiple functions:** It can perform quantitative and qualitative tests on the safety and quality indicators of edible oil.
- **Safe and environmentally friendly:** No need to conduct complex chemical experimental analysis, avoiding the operator from contacting highly corrosive, highly toxic, flammable and explosive high-risk chemicals, improving safety;
- **High sensitivity:** The use of high-sensitivity cooling CCD can realize the detection of low-doped edible oil doping;
- **Strong applicability:** The instrument design takes into account both volume and performance, and meets the various indicators of edible oils such as tea oil, soybean oil, and olive oil;
- **One-button analysis:** Equipped with powerful and user-friendly spectral analysis software, one-button operation means that both experts and first-time users of Raman spectrometers can quickly and accurately collect edible oil data and analyze edible oil indicators.

Description

NY6000 is a comprehensive edible oil quality detection system based on Raman spectroscopy technology. It can truly be a one-machine multi-functional system, achieving accurate and efficient comprehensive coverage of various edible oil indicators. It includes the detection of edible oil food safety indicators (such as mycotoxins, pesticide residues, acid value and peroxide value) and quantitative detection of edible oil fatty acid composition (such as erucic acid, high oleic acid, etc.). In addition, NY6000 can also perform high-end edible oil adulteration and origin identification.

NY6000 is equipped with multifunctional analysis and detection software to achieve rapid analysis of edible oil safety and quality indicators, support users to quickly obtain the information required for oil products, and enable users to make subsequent decisions more easily and improve the quality of edible oil products.

NY6000 is a research and application project of edible oil detection technology based on Raman spectroscopy analysis by Optosky. It is a technology and application innovation that fully expands Raman technology to the field of grain and oil detection.

Application

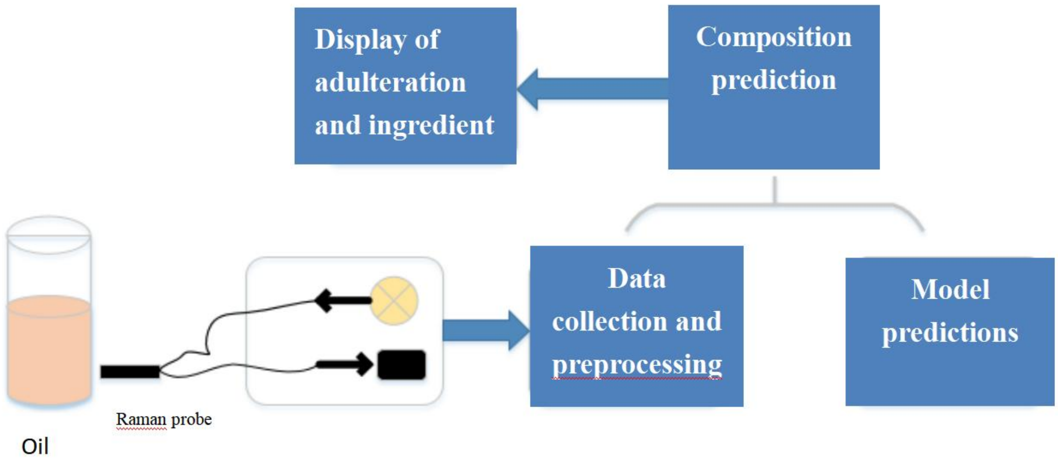
- Edible oil adulteration detection
- Edible oil origin identification
- Edible oil rating and identification
- Edible oil storage quality determination
- Food Safety：Edible oil safety evaluation

1. Principle

The Raman effect occurs when light strikes a molecule and interacts with the electron cloud and molecular bonds in the molecule. For the spontaneous Raman effect, photons excite the molecule from the ground state to a virtual energy state. When the excited molecule emits a photon, it returns to a rotational or vibrational state different from the ground state. The energy difference between the ground state and the new state causes the frequency of the released photon to be different from the wavelength of the exciting light.

The type of edible oil is related to the ratio of saturated and unsaturated fatty acids contained in the edible oil. The intensity of each characteristic peak of the edible oil reflects the content of saturated and unsaturated fatty acids respectively, so the quantification of edible oil doping actually determines the ratio of saturated and unsaturated fatty acid mixtures.

Raman shift(cm^{-1})	Molecular formula	Functional Group	Drive mode
860	— $(CH_2)_n$—	C-C	Stretch Vibration
962	TransRHC=CHR	C=C	Bending vibration
1070	— $(CH_2)_n$—	C-C	Stretch Vibration
1245(unsaturated fatty acid)	cisRHC=CHR	=C-H	Bending vibration
1290(unsaturated fatty acid)	—CH_2	C-H	Bending vibration
1430(unsaturated fatty acid)	—CH_2	C-H	Shear vibration
1645(unsaturated fatty acid)	cisRHC=CHR	C=C	Stretch Vibration
1735	RC=OOR	C=0	Stretch Vibration



NY6000 Schematic diagram

2. Parameter

Application range	**1. Edible oil adulteration detection** Detection of adulteration of edible oil, especially the adulteration of high-end edible oils such as olive oil and tea oil, **can realize the adulteration and counterfeiting of high-end edible oils and the identification of gutter oil.** **2. Identification of edible oil origin** Identify the origin of edible oils mainly based on rapeseed oil, and help regional brand building and identification. **3. Rating and identification of edible oils** By detecting components such as erucic acid and high oleic acid in edible oils, the rating and identification of edible oils mainly based on rapeseed oil can be realized. **4. Determination of storage quality of edible oil** The determination of parameters such as acid value and peroxide value can be realized, **and the nutritional value and storage quality of edible oils such as rapeseed oil can be evaluated.** **5. Safety evaluation of edible oil** Detection of food safety indicators such as **mycotoxins, pesticide residues and solvent residues** in edible oils can be realized to ensure the safety and health of edible oils.

Measurement parameters	1) Quality analysis: oleic acid, erucic acid, fatty acid composition; 2) Safety indicators: mycotoxins (mainly aflatoxin B1), pesticide residues, solvent residues; 3) Purity analysis 4) Origin identification
Detection error	1) Composition analysis: ±2%; 2) Safety index: ±10%; 3) Purity analysis: ±2%;
Measurement type of edible oil	Edible oils such as soybean oil, tea oil, rapeseed oil, corn oil, etc.
Excitation wavelength	1064nm
Spectral range	200-2600cm-1(1064nm)；Wave number range supports customization
Detector	Ultra-high sensitivity cooled (-10°C) back-illuminated 2048*64 array detector
Maximum laser power	450mW
Spectral stability	σ/μ < 0.5% (COT 8 hours)
Temperature stability	Spectral Shift ≤ 1 cm-1 (10-40 ℃)
SNR	>3000:1
Laser diameter	Outer diameter 12.7mm， Aperture8.5mm
Software function	Quantitative measurement of adulteration in edible oils
Interface	USB2.0， Network port
Power supply	DC5V， 3.5A
Weight	< 10 Kg

3. Actual Photos and Application Cases

	第一次	第二次	第三次	平均值（%）	相对误差（%）	茶油理论值（%）	绝对误差（%）	相对误差（%）
1	99. 64	99. 18	99. 54	99. 45	0. 242	100. 00	0. 547	0. 547
2	68. 64	69. 19	70. 55	69. 46	0. 983	67. 52	-1. 936	-2. 867
3	45. 08	44. 39	45. 2	44. 89	0. 437	40. 53	-4. 362	-10. 764
4	99. 09	98. 93	97. 16	98. 39	1. 071	96. 73	-1. 665	-1. 722
5	98. 1	97. 35	97. 57	97. 67	0. 386	96. 73	-0. 945	-0. 977
6	92. 18	91. 46	91. 53	91. 72	0. 397	90. 76	-0. 966	-1. 065
7	60. 71	61. 29	60. 97	60. 99	0. 291	57. 03	-3. 955	-6. 935
8	70. 03	69. 82	69. 85	69. 90	0. 114	67. 52	-2. 376	-3. 519
9	3. 55	2. 92	3. 18	3. 22	0. 317	0. 00	-3. 217	#DIV/0!
10	88. 47	87. 82	88. 76	88. 35	0. 481	87. 86	-0. 493	-0. 561
11	98. 46	99. 09	99. 27	98. 94	0. 425	100. 00	1. 060	1. 060
12	45. 39	44. 76	44. 96	45. 04	0. 322	41. 61	-3. 424	-8. 229
13	89. 85	91. 31	91. 09	90. 75	0. 787	90. 76	0. 007	0. 008
14	90. 4	89. 28	88. 31	89. 33	1. 046	87. 86	-1. 473	-1. 676
15	59. 96	59. 88	59. 87	59. 90	0. 049	57. 03	-2. 869	-5. 030
16	44. 05	43. 65	44. 95	44. 22	0. 666	40. 53	-3. 689	-9. 102
17	87. 46	86. 85	87. 87	87. 39	0. 513	87. 86	0. 464	0. 528
18	93. 41	93. 48	93. 08	93. 32	0. 214	96. 73	3. 405	3. 520
19	78. 39	76. 53	76. 15	77. 02	1. 199	75. 65	-1. 376	-1. 818
20	98. 12	97. 9	97. 9	97. 97	0. 127	100. 00	2. 027	2. 027
21	85. 8	86. 9	86. 53	86. 41	0. 560	85. 44	-0. 973	-1. 138
22	87. 8	87. 14	86. 77	87. 24	0. 522	85. 44	-1. 799	-2. 106
23	86. 02	85. 4	85. 84	85. 75	0. 319	85. 44	-0. 316	-0. 370
24	91. 68	91. 53	91. 27	91. 49	0. 207	90. 76	-0. 736	-0. 811
25	70. 05	69. 56	68. 47	69. 36	0. 809	67. 52	-1. 836	-2. 719
26	90. 83	92. 16	91. 16	91. 38	0. 693	90. 76	-0. 626	-0. 690
27	73. 91	73. 82	72. 61	73. 45	0. 726	75. 65	2. 201	2. 910
28	43. 33	43. 96	44. 75	44. 01	0. 712	40. 53	-3. 486	-8. 601
29	67. 45	69. 14	69. 73	68. 77	1. 183	67. 52	-1. 249	-1. 850
30	86. 83	87. 81	86. 37	87. 00	0. 735	87. 86	0. 854	0. 972
31	3. 12	2. 97	3. 1	3. 06	0. 081	0. 00	-3. 063	#DIV/0!
32	44. 81	44. 88	45. 24	44. 98	0. 231	41. 61	-3. 364	-8. 084
33	60. 06	59. 63	59. 07	59. 59	0. 496	57. 03	-2. 552	-4. 475
34	59. 11	59. 67	59. 11	59. 30	0. 323	57. 03	-2. 262	-3. 966
35	94. 92	96. 44	94. 64	95. 33	0. 969	96. 73	1. 395	1. 442

As shown in the table above, the error of adulteration of edible tea oil tested is basically 2%.