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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 18606-2025

Replacing GB/T 18606-2017

**Determination of biomarkers in sediment and crude oil by gas
chromatography-mass spectrometry**

沉积物和原油中生物标志化合物气相色谱-质谱测定方法

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Foreword

This Standard was drafted in accordance with the provisions of GB/T 1.1-2009.

This Standard is the substitute for GB/T 18606-2001 The Test Method for Biomarkers in Sediment and Crude Oil by GC-MS. Compared with GB/T 18606- 2001, the major technical changes are as follows.

- The identification of the bicyclic sesquiterpene compound m/z 123 and the illustration of its mass chromatogram were added (SEE 5.4);
- The identification of the naphthalene series compounds m/z 128; 142; 156; 170; 184; 198 and the illustration of their mass chromatograms were added (SEE 5.4);
- The identification of the phenanthrene series compounds m/z 178; 192; 206; 220; 234 and the illustration of their mass chromatograms were added (SEE 5.4);
- The identification of the fluoranthene, perylene and pyrene series compounds m/z 202; 216; 228; 252 and the illustration of their mass chromatograms were added (SEE 5.4);
- The identification of the biphenyl and dibenzofuran series compounds m/z 154; 168; 182 and the illustration of their mass chromatograms were added (SEE 5.4);
- The identification of the dibenzothiophene and benzo-naphthylthiophene series compounds m/z 184; 198; 234 and the illustration of their mass chromatograms were added (SEE 5.4);
- The identification of the fluorene series compounds m/z 166; 180 and the illustration of

their mass chromatograms were added (SEE 5.4);

- The quality chromatogram of the original standard was modified (SEE

Appendix B).

This Standard was proposed by China National Petroleum Corporation.

This Standard shall be under the jurisdiction of the National Technical Committee for Standardization of Petroleum and Gas (SAC/TC 355).

Drafting organizations of this Standard. Research Institute of Petroleum Exploration & Development, China National Petroleum Corporation; Wuxi Institute of Petroleum Geology, Research Institute of Petroleum Exploration & Development, China National Petroleum Corporation; College of Earth Environment and Water Resources, Yangtze University; Research Institute of The test method for biomarkers in sediment and crude oil by GC-MS

1 Scope

This Standard specifies the GC-MS identification method and quality requirements for saturated hydrocarbon and aromatic hydrocarbon component biomarkers in sediment and crude oil.

This Standard is applicable to the analysis and identification of biomarker compounds of saturated hydrocarbon and aromatic hydrocarbon components in sediment and crude oil.

2 Normative references

GB/T 6379.1-2004

3 Methodological principle

The saturated hydrocarbon and aromatic hydrocarbon components prepared from the sediment and crude oil are separated by gas chromatography and detected by mass spectrometry. After being processed by the data processing system, the desired total ion chromatogram, mass chromatogram, and mass spectrum are obtained.

4.1 Gas chromatography-mass spectrometer. A gas chromatograph with

programmed temperature rising function and a mass spectrometer and data processing system with an EI ion source and a maximum scanning mass of not less than 650amu.

5.3.2 Perfluorotributylamine is tuned to the normal operating state. The ratio

of each ion peak after tuning should be appropriate. If it is required to comply with spectral library retrieval, the ion peak of m/z 69 shall be tuned to 100%; the ion peak of m/z 219

shall be tuned to less than or equal to 80%, and greater than or equal to 40%; the ion peak of m/z 502 shall be tuned to greater than or equal to 2%, and less than or equal to 5%.

5.3.3 SET the analysis conditions for samples.

5.3.4 After the blank and internal management samples have passed the test,

the saturated hydrocarbons and aromatic hydrocarbons are dissolved in *n*-hexane or dichloromethane prior to sample determination.

5.3.5 CARRY out data processing.

5.4.1 Mass chromatogram

At least the following spectrograms shall be extracted from the analysis report.

a) Saturated hydrocarbons include.

1) Tricyclic terpane and hopane m/z 191 mass chromatogram, as shown in Figure B.1;

2) Sterane m/z 217 mass chromatogram, as shown in Figure B.2;

3) Bicyclic sesquiterpene m/z 123 mass chromatogram, as shown in Figure B.3.

b) Aromatic hydrocarbons include.

1) Naphthalene series compounds m/z 128; 142; 156; 170; 184; 198 mass chromatograms, as shown in Figure B.4;

2) Phenanthrene series compounds m/z 178; 192; 206; 220; 234 mass chromatograms, as shown in Figure B.5;

3) Fluoranthene, perylene and pyrene series compounds m/z 202; 216; 228;

252 mass chromatograms, as shown in Figure B.6;

4) Biphenyl and dibenzofuran series compounds m/z 154; 168; 182 mass chromatograms, as shown in Figure B.7;

5) Fluorene series compounds m/z 166; 180 mass chromatograms, as shown in Figure B.8.

5.4.2 Qualitative results

SEE Appendix A for the nomenclature of saturated hydrocarbon and aromatic hydrocarbon. For the qualitative results of saturated hydrocarbon, SEE

Appendix B for related spectrograms as well as Table 1 (tricyclic terpane and

Table 3 -- Identification table for bicyclic sesquiterpene compounds in m/z 123 mass

chromatogram Peak No. Molecular formula Molecular weight Compound name

10 C16H30 222 8beta(H)-homodrimane (C16)

Table 4 -- Identification table for compounds in the mass chromatogram of aromatic hydrocarbons

Peak No.	Mass chromatogram (m/z)	Molecular formula	Molecular weight	Compound name
1	128	C10H8	128	Naphthalene
2	142	C11H10	142	2-methylnaphthalene
3	142	C11H10	142	1-methylnaphthalene
4	156	C12H12	156	2-ethylnaphthalene
5	156	C12H12	156	1-ethylnaphthalene
6	156	C12H12	156	2, 6-dimethylnaphthalene + 2, 7-dimethylnaphthalene
7	156	C12H12	156	1, 3-dimethylnaphthalene + 1, 7-dimethylnaphthalene
8	156	C12H12	156	1, 6-dimethylnaphthalene
9	156	C12H12	156	1, 4-dimethylnaphthalene + 2, 3-dimethylnaphthalene
10	156	C12H12	156	1, 5-dimethylnaphthalene
11	156	C12H12	156	1, 2-dimethylnaphthalene
12	170	C13H14	170	1, 3, 7-trimethylnaphthalene
13	170	C13H14	170	1, 3, 6-trimethylnaphthalene
14	170	C13H14	170	1, 3, 5-trimethylnaphthalene + 1, 4, 6-trimethylnaphthalene
15	170	C13H14	170	2, 3, 6-trimethylnaphthalene
16	170	C13H14	170	1, 2, 7-trimethylnaphthalene + 1, 6, 7-trimethylnaphthalene
17	170	C13H14	170	2, 3, 5-trimethylnaphthalene
18	170	C13H14	170	1, 2, 4-trimethylnaphthalene
19	170	C13H14	170	1, 2, 5-trimethylnaphthalene
20	170	C13H14	170	1, 2, 3-trimethylnaphthalene
52	206	C16H14	206	2, 3-dimethylphenanthrene
53	206	C16H14	206	1, 9 + 4, 9 + 4, 10-dimethylphenanthrene
54	206	C16H14	206	1, 8-dimethylphenanthrene
55	206	C16H14	206	1, 2-dimethylphenanthrene
56	234	C18H18	234	Retene
57	234	C16H10S	234	Benzo [b] naphthalene [2, 1-d] thiophenol
58	234	C16H10S	234	Benzo [b] naphthalene [1, 2-d] thiophenol
59	234	C16H10S	234	Benzo [b] naphthalene [2, 3-d] thiophenol
60	202	C16H10	202	Fluoranthene
61	202	C16H10	202	Pyrene
62	216	C17H12	216	Benzo [a] fluorene
63	216	C17H12	216	Benzo [b] fluorene + 4-methylpyrene
64	216	C17H12	216	2-methylpyrene
65	216	C17H12	216	1-methylpyrene
66	216	C17H12	216	Methyl fluoranthene
67	228	C18H12	228	Benzo [c] anthracene
68	228	C18H12	228	Benzo [a] anthracene
69	228	C18H12	228	Chrysene
70	252	C20H12	252	Benzo [k] fluoranthene
71	252	C20H12	252	Benzo [e] pyrene
72	252	C20H12	252	Benzo [a] pyrene
73	252	C20H12	252	Perylene
74	154	C12H10	154	Biphenyl
75	168	C13H12	168	3-methyl biphenyl
76	168	C13H12	168	4-methyl biphenyl
77	168	C12H8O	168	Dibenzofuran
78	182	C14H14	182	3-ethyl biphenyl
79	182	C14H14	182	3, 5-dimethylbenzidine
80	182	C14H14	182	3, 3'-dimethylbenzidine
81	182	C14H14	182	4-ethyl biphenyl
82	182	C14H14	182	3, 4'-dimethylbenzidine
83	182	C14H14	182	4, 4'-dimethylbenzidine
84	182	C13H10O	182	Methyl dibenzofuran
85	182	C13H10O	182	Methyl dibenzofuran
86	182	C13H10O	182	Methyl dibenzofuran
87	166	C13H10	166	Fluorene
88	180	C14H12	180	2-Methyl fluorene
89	180	C14H12	180	1-Methyl fluorene

3) Steranes shall be named for configurations at carbon positions 5, 8, 9, 10, 13, 14, 17, and 20. However, since some of these configurations are stable and some cannot be changed by hydrogen exchange, regular sterane only needs to be labeled as the configurations at carbon positions 5, 14, 17 and 20, and diasterane only needs to be