Table S1 Performance description of ten metal oxide sensors in PEN3 electronic nose.

| No. | Sensor code | Performance description | Reference | (mL/m³) |
|-----|-------------|-------------------------|-----------|---------|
| 1   | W1C         | Aromatic and benzene compounds | C₇H₈, 10  |         |
| 2   | W5S         | Broad range sensitivity, sensitive to nitrogen oxides | NO₂, 1    |         |
| 3   | W3C         | Ammonia, sensitive to aromatic compounds | C₆H₆, 10  |         |
| 4   | W6S         | Mainly hydrogen, selectively | H₂, 100   |         |
| 5   | W5C         | Alkane, aromatic compounds | C₃H₈, 1   |         |
| 6   | W1S         | Sensitive to methane | CH₄, 100  |         |
| 7   | W1W         | Sensitive to many organic compounds | H₂S, 1    |         |
| 8   | W2S         | Alcohol, sensitive to aromatic compounds with broad range | CO, 100   |         |
| 9   | W2W         | Aromatic and sulfur organic compounds | H₂S, 1    |         |
| 10  | W3S         | Reacts on high concentrations, sensitive to several compounds | CH₄, 100  |         |
Table S2 Quantified data of volatile flavor collected from the control mackerel during 0–100 days of frozen storage.

| Sensor code | 0 day   | 20 day   | 40 day   | 60 day   | 80 day   | 100 day  |
|-------------|---------|----------|----------|----------|----------|----------|
| W1C         | 1.3 ± 0.1a | 2.9 ± 0.2b | 2.9 ± 0.2b | 4.5 ± 0.1c | 6.0 ± 0.3d | 8.0 ± 0.4e |
| W5S         | 8.7 ± 0.1c | 9.7 ± 0.2d | 9.1 ± 0.2c | 8.4 ± 0.2c | 6.5 ± 0.2b | 5.0 ± 0.1a |
| W3C         | 1.3 ± 0.1a | 2.7 ± 0.2b | 3.0 ± 0.1b | 4.3 ± 0.2c | 6.5 ± 0.2d | 8.2 ± 0.3e |
| W6S         | 0.6 ± 0.1a | 2.1 ± 0.1b | 2.2 ± 0.2b | 3.5 ± 0.2c | 7.1 ± 0.3d | 8.7 ± 0.3e |
| W5C         | 1.0 ± 0.1a | 2.6 ± 0.2b | 3.0 ± 0.3b | 4.0 ± 0.2c | 6.8 ± 0.4d | 8.5 ± 0.3e |
| W1S         | 1.0 ± 0.1a | 2.7 ± 0.1b | 3.0 ± 0.2b | 4.1 ± 0.1c | 4.3 ± 0.2c | 4.3 ± 0.2c |
| W1W         | 0.9 ± 0.1a | 3.0 ± 0.2b | 3.2 ± 0.1b | 4.7 ± 0.2c | 7.8 ± 0.3d | 9.2 ± 0.3e |
| W2S         | 0.7 ± 0.1a | 2.1 ± 0.2b | 2.8 ± 0.3b | 3.8 ± 0.2c | 8.5 ± 0.4d | 9.3 ± 0.4d |
| W2W         | 0.9 ± 0.1a | 2.8 ± 0.2b | 3.2 ± 0.3b | 4.7 ± 0.1c | 9.0 ± 0.3d | 10.0 ± 0.4d |
| W3S         | 0.8 ± 0.1a | 2.4 ± 0.1b | 3.0 ± 0.2c | 4.0 ± 0.1d | 8.5 ± 0.3e | 9.8 ± 0.2f |

Data represent the means ± standard deviation of 3 replicates. The means with different uppercase letters in the same row were significantly different at $P < 0.05$. 
Table S3 Quantified data of volatile flavor collected from the control, 1.5% CO soaked-, 3.0% CO soaked-, and 4.5% CO soaked-samples (B) after 100 days of frozen storage.

| Sensor code | control | 1.5% CO | 3.0% CO | 4.5% CO |
|-------------|---------|---------|---------|---------|
| W1C         | 8.0 ± 0.2c | 7.3 ± 0.2b | 6.1 ± 0.2a | 5.9 ± 0.2a |
| W5S         | 5.0 ± 0.1a  | 5.7 ± 0.2a  | 7.6 ± 0.3b  | 7.0 ± 0.3b  |
| W3C         | 8.2 ± 0.3d  | 7.2 ± 0.1c  | 5.2 ± 0.1b  | 4.5 ± 0.1a  |
| W6S         | 8.7 ± 0.3b  | 8.5 ± 0.3b  | 4.6 ± 0.2a  | 5.2 ± 0.2a  |
| W5C         | 8.5 ± 0.2c  | 7.0 ± 0.2b  | 5.3 ± 0.2a  | 5.0 ± 0.2a  |
| W1S         | 4.3 ± 0.2a  | 4.5 ± 0.1a  | 4.0 ± 0.1a  | 4.2 ± 0.1a  |
| W1W         | 9.2 ± 0.2c  | 7.8 ± 0.3b  | 6.2 ± 0.1a  | 6.8 ± 0.3a  |
| W2S         | 9.3 ± 0.2c  | 8.6 ± 0.2b  | 5.8 ± 0.2a  | 5.4 ± 0.1a  |
| W2W         | 10.0 ± 0.3c | 8.5 ± 0.2b  | 6.6 ± 0.2a  | 6.0 ± 0.2a  |
| W3S         | 9.8 ± 0.2c  | 8.0 ± 0.1b  | 5.0 ± 0.3a  | 5.1 ± 0.2a  |

Data represent the means ± standard deviation of 3 replicates. The means with different uppercase letters in the same row were significantly different at $P < 0.05$. 