**[Supplemental materials]**



Fig. S1. Time profiles of CH4 and DMS concentrations. (a) CH4 concentrations of De-MO-1; (b) DMS concentrations of De-MO-1; (c) CH4 concentrations of De-MO-2; and (d) DMS concentration of De-MO-2.



Fig. S2. Time profiles of CH4 and DMS concentrations by the physical adsorption. (a) CH4 concentrations of the microbial agents after sterilization; and (b) DMS concentrations of the microbial agents after sterilization.

Table S1. Change of the bacterial community structure of De-MO-1 at genus level

|  |  |
| --- | --- |
| Genus | Relative abundance (%) at storage time |
| 0 d | 75 d | 225 d | 375 d |
| *Isoptericola* | 31.51±3.93 | 19.80±2.58 | 15.04±1.12 | 13.27±1.11 |
| *Streptomyces* | 10.13±6.27 | 7.47±0.93 | 6.42±1.66 | 5.73±1.31 |
| *Brachybacterium* | 5.56±1.43 | 0.27±0.07 | 0.30±0.06 | 0.33±0.01 |
| *Norcardia* | 4.89±3.48 | 3.13±0.52 | 4.38±1.38 | 4.30±0.66 |
| *Promicromonospora* | 3.91±0.24 | 2.88±0.03 | 3.53±0.22 | 4.44±0.20 |
| *Rudaibacter* | 3.50±0.27 | 2.74±0.25 | 3.21±0.13 | 3.13±0.18 |
| *Microbacterium* | 3.10±0.80 | 0.77±0.10 | 1.02±0.34 | 1.00±0.20 |
| *Sphaerobacter* | 2.84±0.55 | 2.27±0.30 | 2.79±0.24 | 2.41±0.01 |
| *Paracoccus* | 2.56±0.71 | 2.50±0.49 | 1.91±0.70 | 2.01±0.26 |
| *Bacillus* | 2.13±1.08 | 1.10±0.16 | 0.89±0.25 | 0.93±0.33 |
| *Staphylococcus* | 1.91±0.34 | 0.05±0.03 | 0.04±0.01 | 0.03±0.00 |
| *Corynebacterium* | 1.53±0.78 | 0.05±0.00 | 0.06±0.01 | 0.07±0.01 |
| *Dietzia* | 1.41±0.70 | 0.18±0.00 | 0.22±0.06 | 0.18±0.04 |
| *Brucella* | 1.34±0.52 | 1.63±0.04 | 1.13±0.02 | 1.11±0.02 |
| *Arthrobacter* | 1.32±0.67 | 0.51±0.09 | 0.48±0.14 | 0.45±0.10 |
| *Nitratireductor* | 1.20±0.38 | 2.41±0.31 | 2.13±0.75 | 2.24±0.27 |
| *Pelistega* | 1.02±0.70 | 1.35±0.30 | 1.07±0.00 | 1.52±0.21 |
| *Rhodococcus* | 0.91±0.63 | 0.54±0.10 | 0.55±0.14 | 0.50±0.05 |
| *Phycicoccus* | 0.90±0.34 | 0.35±0.06 | 0.35±0.03 | 0.37±0.01 |
| *Mucilaginibacter* | 0.86±0.29 | 1.09±0.51 | 0.92±0.35 | 1.54±0.61 |
| *Haloactinobacterium* | 0.84±0.15 | 0.68±0.05 | 1.13±0.04 | 1.04±0.11 |
| *Lysobacter* | 0.72±0.35 | 2.81±1.11 | 2.34±0.71 | 3.01±0.72 |
| *Sphingobacterium* | 0.53±0.05 | 0.22±0.07 | 0.14±0.01 | 0.25±0.06 |
| *Advenella* | 0.48±0.26 | 0.16±0.08 | 0.14±0.05 | 0.19±0.05 |
| *Rhodanobacter* | 0.39±0.16 | 1.72±0.72 | 0.95±0.36 | 1.26±0.39 |
| *Chujaibacter* | 0.31±0.54 | 0.01±0.01 | 0.00±0.00 | 0.00±0.01 |
| *Hyphomicrobium* | 0.19±0.11 | 0.76±0.18 | 0.72±0.24 | 0.70±0.12 |
| *Mesorhizobium* | 0.15±0.03 | 2.49±0.63 | 2.62±1.05 | 2.44±0.40 |
| *Sphingopyxis* | 0.15±0.03 | 0.99±0.48 | 0.71±0.31 | 0.88±0.33 |
| *Rhodonellum* | 0.12±0.04 | 0.71±0.08 | 0.90±0.13 | 1.04±0.20 |
| *Luteimonas* | 0.11±0.03 | 1.37±0.56 | 1.22±0.34 | 1.58±0.34 |
| *Noviherbaspirillum* | 0.09±0.01 | 0.50±0.01 | 0.54±0.10 | 0.67±0.04 |
| *Actinomadura* | 0.09±0.04 | 2.61±0.60 | 5.48±2.12 | 4.72±1.48 |
| *Pusillimonas* | 0.06±0.01 | 0.16±0.06 | 0.12±0.05 | 0.20±0.04 |
| *Vulgatibacter* | 0.06±0.03 | 0.73±0.04 | 0.99±0.06 | 0.92±0.02 |
| *Porphyrobacter* | 0.06±0.04 | 1.97±0.55 | 1.59±0.07 | 1.96±0.18 |
| *Lewinella* | 0.03±0.01 | 0.51±0.24 | 0.38±0.00 | 0.64±0.07 |
| *Aquihabitans* | 0.01±0.01 | 0.46±0.03 | 1.01±0.03 | 0.99±0.12 |
| *Nitrobacter* | 0.01±0.01 | 1.54±0.18 | 1.78±0.64 | 1.63±0.21 |
| *Thiobacillus* | 0.01±0.00 | 0.04±0.00 | 0.13±0.17 | 0.02±0.00 |
| *Methylocystis* | 0.257±0.402 | 0.065±0.006 | 0.060±0.004 | 0.059±0.001 |
| *Methylobacter* | 0.005±0.004 | 0.001±0.000 | 0.002±0.001 | 0.008±0.002 |
| *Methylocaldum* | 0.003±0.000 | 0.001±0.001 | 0.002±0.002 | 0.002±0.003 |
| *Methylococcus* | N.D. | N.D. | N.D. | N.D. |
| Others | 12.80±2.87 | 28.42±1.59 | 30.57±3.68 | 30.21±2.07 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 |

N.D.; not detected

Table S2. Change of the bacterial community structure of De-MO-2 at genus level

|  |  |
| --- | --- |
| Genus | Relative abundance (%) at storage time |
| 0 d | 75 d | 225 d | 375 d |
| *Isoptericola* | 31.51±3.93 | 10.24±0.17 | 9.66±0.47 | 4.20±0.71 |
| *Streptomyces* | 10.13±6.27 | 3.26±0.47 | 3.21±0.55 | 2.75±0.13 |
| *Brachybacterium* | 5.56±1.43 | 0.90±0.07 | 1.21±0.02 | 1.35±0.09 |
| *Norcardia* | 4.89±3.48 | 1.23±0.21 | 1.76±0.33 | 1.76±0.03 |
| *Promicromonospora* | 3.91±0.24 | 2.93±0.40 | 3.12±0.08 | 2.97±0.06 |
| *Rudaibacter* | 3.50±0.27 | 1.63±0.02 | 1.95±0.22 | 2.10±0.08 |
| *Microbacterium* | 3.10±0.80 | 1.85±0.28 | 1.73±0.19 | 1.80±0.08 |
| *Sphaerobacter* | 2.84±0.55 | 2.84±0.38 | 4.09±0.31 | 2.91±0.18 |
| *Paracoccus* | 2.56±0.71 | 1.76±0.48 | 2.01±0.34 | 2.33±0.04 |
| *Bacillus* | 2.13±1.08 | 0.78±0.35 | 0.93±0.15 | 0.80±0.04 |
| *Staphylococcus* | 1.91±0.34 | 0.19±0.02 | 0.15±0.01 | 0.08±0.01 |
| *Corynebacterium* | 1.53±0.78 | 0.17±0.04 | 0.15±0.01 | 0.17±0.01 |
| *Dietzia* | 1.41±0.70 | 0.28±0.05 | 0.37±0.08 | 0.40±0.06 |
| *Brucella* | 1.34±0.52 | 1.63±0.32 | 1.24±0.06 | 1.19±0.05 |
| *Arthrobacter* | 1.32±0.67 | 0.33±0.13 | 0.22±0.01 | 0.29±0.00 |
| *Nitratireductor* | 1.20±0.38 | 2.36±0.53 | 3.02±0.42 | 3.00±0.04 |
| *Pelistega* | 1.02±0.70 | 3.94±0.62 | 4.48±0.39 | 4.47±0.10 |
| *Rhodococcus* | 0.91±0.63 | 0.22±0.07 | 0.28±0.01 | 0.22±0.04 |
| *Phycicoccus* | 0.90±0.34 | 0.53±0.10 | 0.47±0.02 | 0.50±0.03 |
| *Mucilaginibacter* | 0.86±0.29 | 3.41±0.87 | 2.34±0.18 | 3.15±0.37 |
| *Haloactinobacterium* | 0.84±0.15 | 1.09±0.02 | 1.79±0.03 | 1.68±0.07 |
| *Lysobacter* | 0.72±0.35 | 8.97±2.36 | 5.21±0.93 | 4.78±0.42 |
| *Sphingobacterium* | 0.53±0.05 | 1.64±0.21 | 1.66±0.18 | 1.77±0.13 |
| *Advenella* | 0.48±0.26 | 0.70±0.24 | 0.68±0.02 | 0.60±0.08 |
| *Rhodanobacter* | 0.39±0.16 | 0.09±0.05 | 0.07±0.01 | 0.28±0.02 |
| *Chujaibacter* | 0.31±0.54 | 0.02±0.02 | 0.02±0.01 | 0.02±0.01 |
| *Hyphomicrobium* | 0.19±0.11 | 0.28±0.03 | 0.38±0.09 | 0.37±0.03 |
| *Mesorhizobium* | 0.15±0.03 | 0.74±0.14 | 0.83±0.12 | 0.71±0.08 |
| *Sphingopyxis* | 0.15±0.03 | 3.24±0.31 | 2.23±0.40 | 2.57±0.64 |
| *Rhodonellum* | 0.12±0.04 | 1.52±0.37 | 2.28±0.13 | 2.69±0.10 |
| *Luteimonas* | 0.11±0.03 | 2.35±0.46 | 1.38±0.19 | 1.35±0.01 |
| *Noviherbaspirillum* | 0.09±0.01 | 1.42±0.19 | 1.73±0.04 | 1.65±0.30 |
| *Actinomadura* | 0.09±0.04 | 1.02±0.20 | 0.61±0.10 | 0.59±0.01 |
| *Pusillimonas* | 0.06±0.01 | 1.00±0.33 | 0.86±0.03 | 0.78±0.16 |
| *Vulgatibacter* | 0.06±0.03 | 0.25±0.08 | 0.30±0.04 | 0.25±0.03 |
| *Porphyrobacter* | 0.06±0.04 | 3.28±0.30 | 3.02±0.02 | 2.59±0.00 |
| *Lewinella* | 0.03±0.01 | 0.96±0.07 | 0.67±0.13 | 0.76±0.09 |
| *Aquihabitans* | 0.01±0.01 | 0.93±0.01 | 2.07±0.11 | 1.54±0.20 |
| *Nitrobacter* | 0.01±0.01 | 0.30±0.06 | 0.26±0.06 | 0.26±0.09 |
| *Thiobacillus* | 0.01±0.00 | 0.56±0.09 | 0.45±0.05 | 0.39±0.12 |
| *Methylocystis* | 0.257±0.402 | 0.240±0.017 | 0.120±0.007 | 0.134±0.036 |
| *Methylobacter* | 0.005±0.004 | 0.010±0.004 | 0.008±0.001 | 0.010±0.008 |
| *Methylocaldum* | 0.003±0.000 | 0.008±0.000 | 0.001±0.001 | 0.002±0.000 |
| *Methylococcus* | N.D. | 0.002±0.003 | 0.001±0.001 | N.D. |
| Others | 12.80±2.87 | 28.86±1.13 | 31.00±1.11 | 37.81±0.51 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 |

N.D.; not detected