

Nitro-polycyclic aromatic hydrocarbons - Crystalline nitro-PAHs

| Code | Material | Purity |
|---------|--|----------------------------|
| BCR-305 | 1-NitroPyrene (10 mg) | 0.9976 ± 0.0007 |
| BCR-306 | 1-Nitronaphthalene (10 mg) | 0.996 ± 0.0010 |
| BCR-307 | 2-Nitronaphthalene (10 mg) | 0.9977 + 0.0009 / -0.0011 |
| BCR-308 | 9-NitroAnthracene (10 mg) | 0.9975 ± 0.0010 |
| BCR-309 | 6-Nitrochrysene (10 mg) | 0.989 ± 0.004 |
| BCR-310 | 3-NitroFlouranthene (10 mg) | 0.9968 + 0.0012 / -0.0021 |
| BCR-311 | 6-NitroBenzo[a]pyrene (10 mg) | 0.9978 + 0.000 8 / -0.0010 |
| BCR-312 | 2-Nitro-7-methoxynaphtho[2.1-b]furan (10 mg) | 0.9984 ± 0.0007 |

Oxygenated polycyclic aromatic hydrocarbons - Crystalline oxygenated PAHs

| Code | Material | Purity |
|---------|---|----------------------------|
| BCR-337 | Dibenzo[b,d]furan (10 mg) | 0.987 ± 0.007 |
| BCR-338 | 4H-Cyclopenta[def]phenanthren-4-one (10 mg) | 0.9951 ± 0.0030 |
| BCR-340 | Benzo[b]naphtho[1,2-d]furan (10 mg) | 0.997 + 0.003 / -0.005 |
| BCR-341 | Benzo[b]naphtho[2,1-d]furan (10 mg) | 0.996 + 0.004 / - 0.005 |
| BCR-342 | Benzo[a]fluorenone (10 mg) | 0.9979 + 0.0021 / - 0.0022 |

Oxygenated polycyclic aromatic hydrocarbons

ERM-AC213: PAHs in Toluene

| | Mass fraction, (µg/g) |
|------------------------|-----------------------|
| Benzo[a]anthracene | 3.09 ± 0.04 |
| Chrysene | 3.06 ± 0.05 |
| 5-methylchrysene | 3.08 ± 0.07 |
| Benzo[b]fluoranthene | 3.05 ± 0.05 |
| Benzo[k]fluoranthene | 3.06 ± 0.08 |
| Benzo[j]fluoranthene | 3.05 ± 0.10 |
| Benzo[a]pyrene | 2.86 ± 0.07 |
| Indeno[1,2,3-cd]pyrene | 3.04 ± 0.05 |
| Dibenz[a,h]anthracene | 2.76 ± 0.05 |
| Benzo[ghi]perylene | 3.07 ± 0.05 |
| Dibenzo[a,l]pyrene | 2.85 ± 0.10 |
| Dibenzo[a,e]pyrene | 2.97 ± 0.10 |

How to order reference materials

From JRC in Geel

Tel.: +32 14 571 705 · Fax: +32 14 590 406
<https://ec.europa.eu/jrc/en/reference-materials>
 E-mail: jrc-imm-rm-distribution@ec.europa.eu

From authorised distributors

LGC Standards GmbH (DE)

<http://www.lgcstandards.com/>
 E-mail: de@lgcstandards.com

Sigma-Aldrich Chemie GmbH (CH)

<http://www.sigmaaldrich.com/irimm>
 E-mail: flukatec@sial.com

Sigma-Aldrich RTC Inc. (USA)

<http://www.RT-Corp.com>
 E-mail: RTCSalesgroup@sial.com

ARMI (USA)

<http://www.armi.com>
 E-mail: info@armi.com

Industrial Analytical (RSA)

<http://www.industrialanalytical.co.za>
 E-mail: info@industrialanalytical.co.za

Joint Research Centre Certified reference materials for pure PAHs, PCBs and dioxins



Polychlorinated biphenyls (PCBs) BCR-365, PCBs in iso-octane

| Congener | Mass fraction [mg/kg] |
|--|-----------------------|
| 2,4' - Dichlorobiphenyl (PCB-8) | 11.4 ± 0.4 |
| 2,3,3' - Trichlorobiphenyl (PCB-20) | 15.2 ± 0.9 |
| 2,4,4' - Trichlorobiphenyl (PCB-28) | 24.8 ± 1.1 |
| 3,3',4-Trichlorobiphenyl (PCB-35) | 14.3 ± 0.8 |
| 2,2',5,5' - Tetrachlorobiphenyl (PCB-52) | 14.8 ± 0.6 |
| 2,2',4,5,5' - Pentachlorobiphenyl (PCB-101) | 14.4 ± 0.6 |
| 2,3',4,4',5 - Pentachlorobiphenyl (PCB-118) | 14.9 ± 0.8 |
| 2,2',3,4,4',5' - Hexachlorobiphenyl (PCB-138) | 8.6 ± 0.6 |
| 2,2',4,4',5,5' - Hexachlorobiphenyl (PCB-153) | 14.2 ± 0.6 |
| 2,2',3,4,4',5,5' - Heptachlorobiphenyl (PCB-180) | 15.2 ± 0.6 |

Polychlorinated biphenyls (PCBs) - Crystalline PCBs

| Code | Material | Purity |
|---------|--|---------------------------|
| BCR-289 | 2,4' - Dichlorobiphenyl (PCB-8) (25 mg) | 0.9963 + 0.005/-0.0018 |
| BCR-290 | 2,3,3' - Trichlorobiphenyl (PCB-20) (25 mg) | 0.9985 ± 0.0013 |
| BCR-291 | 2,4,4' - Trichlorobiphenyl (PCB-28) (25 mg) | 0.9979 ± 0.0013 |
| BCR-293 | 2,2',5,5' - Tetrachlorobiphenyl (PCB-52) (25 mg) | 0.9959 ± 0.0025 |
| BCR-296 | 2,2',3,4,4',5' - Hexachlorobiphenyl (PCB-138) (25 mg) | 0.9992 ± 0.0007 |
| BCR-297 | 2,2',4,4',5,5' - Hexachlorobiphenyl (PCB-153) (25 mg) | 0.9994 + 0.0009 / -0.0005 |
| BCR-298 | 2,2',3,4,4',5,5' - Heptachlorobiphenyl (PCB-180) (25 mg) | 0.9957 ± 0.001 4 |

Confidence in measurements

All certificates and detailed production information can be found at <https://crm.irmm.jrc.ec.europa.eu>

Polychlorinated dibenzodioxins and –furans (PCDDs and PCDFs)

BCR-614 Solutions S1-S7 contain about 1 mL solution and BCR-614 Solution S8 about 0.5 mL. The solutions are available individually or as a set. A set consists of 11 ampoules, one of S2, S4-S8 and two of S1 and S3. In addition, the set contains an additional solution S9, which is not certified. This solution is intended as complementary tool for QA/QC purposes.

Expanded uncertainties typically are between 0.5 to 2 %. Indicative values for the volume fractions are given.

| | S0 [mg/kg] | S1 [mg/kg] | S2 [mg/kg] | S3 [mg/kg] | S4 [mg/kg] | S5 [mg/kg] | S6 [mg/kg] | S7 [mg/kg] | S8 [mg/kg] |
|---|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| unlabelled compounds | | | | | | | | | |
| 2,3,7,8- <i>T₄</i> CDD | 0.137 | 0.273 | 1.09 | 5.47 | 27.3 | 109 | | | |
| 1,2,3,7,8- <i>P₅</i> CDD | 0.698 | 1.394 | 5.57 | 27.9 | 139.3 | 557.1 | | | |
| 1,2,3,4,7,8-HCDD | 0.688 | 1.37 | 5.49 | 27.5 | 137 | 549.7 | | | |
| 1,2,3,6,7,8-HCDD | 0.696 | 1.391 | 5.56 | 27.81 | 139.1 | 556 | | | |
| 1,2,3,7,8,9-HCDD | 0.705 | 1.408 | 5.63 | 28.17 | 140.8 | 563 | | | |
| 1,2,3,4,6,7,8-HCDD | 1.4 | 2.8 | 11.18 | 55.9 | 280 | 1118.6 | | | |
| 1,2,3,4,6,7,8,9- <i>O₈</i> CDD | 1.396 | 2.787 | 11.15 | 55.74 | 278.7 | 1115 | | | |
| 2,3,7,8- <i>T₄</i> CDF | 0.139 7 | 0.279 0 | 1.116 | 5.58 | 27.89 | 1116 | | | |
| 1,2,3,7,8- <i>P₅</i> CDF | 0.707 | 1.412 | 5.65 | 28.2 | 141.2 | 565 | | | |
| 2,3,4,7,8- <i>P₅</i> CDF | 0.698 | 1.395 | 5.58 | 27.9 | 139.5 | 558 | | | |
| 1,2,3,4,7,8-HCDF | 0.7 | 1.398 | 5.59 | 27.96 | 139.8 | 559 | | | |
| 1,2,3,6,7,8-HCDF | 0.698 | 1.393 | 5.57 | 27.87 | 139.3 | 557 | | | |
| 1,2,3,7,8,9-HCDF | 0.699 | 1.397 | 5.59 | 27.9 | 139.6 | 559 | | | |
| 2,3,4,6,7,8-HCDF | 0.694 | 1.387 | 5.55 | 27.73 | 138.7 | 555 | | | |
| 1,2,3,4,6,7,8-HCDF | 1.396 | 2.787 | 11.15 | 55.74 | 278.7 | 1115 | | | |
| 1,2,3,4,7,8,9-HCDF | 1.394 | 2.78 | 11.14 | 55.7 | 278 | 1114.4 | | | |
| 1,2,3,4,6,7,8,9- <i>O₈</i> CDF | 1.397 | 2.79 | 11.16 | 55.8 | 279 | 1116.9 | | | |
| ¹³C labelled compounds | | | | | | | | | |
| ¹³ C-2,3,7,8- <i>T₄</i> CDD | 13.95 | 13.95 | 13.95 | 13.95 | 13.95 | 13.95 | | 139.5 | |
| ¹³ C-1,2,3,7,8- <i>P₅</i> CDD | 13.9 | 13.9 | 13.9 | 13.9 | 13.99 | 13.9 | | 139 | |
| ¹³ C-1,2,3,4,7,8-HCDD | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | | 139.8 | |
| ¹³ C-1,2,3,6,7,8-HCDD | 13.94 | 13.93 | 13.93 | 13.93 | 13.93 | 13.93 | | 139.3 | |
| ¹³ C-1,2,3,7,8,9-HCDD | 13.95 | 13.94 | 13.94 | 13.95 | 13.94 | 13.95 | | | 558 |
| ¹³ C-1,2,3,4,6,7,8-HCDD | 27.9 | 27.9 | 27.9 | 27.9 | 27.9 | 27.9 | | 279 | |
| ¹³ C-1,2,3,4,6,7,8,9- <i>O₈</i> CDD | 27.87 | 27.86 | 27.86 | 27.87 | 27.86 | 27.86 | | 278.7 | |
| ¹³ C-2,3,7,8- <i>T₄</i> CDF | 13.96 | 13.96 | 13.96 | 13.96 | 13.96 | 13.96 | | 139.5 | |
| ¹³ C-1,2,3,7,8- <i>P₅</i> CDF | 13.94 | 13.93 | 13.93 | 13.93 | 13.93 | 13.93 | 139.3 | | |
| ¹³ C-2,3,4,7,8- <i>P₅</i> CDF | 13.95 | 13.94 | 13.94 | 13.94 | 13.94 | 13.94 | | 139.2 | |
| ¹³ C-1,2,3,4,7,8-HCDF | 13.9 | 13.89 | 13.89 | 13.9 | 13.89 | 13.89 | | 138.9 | |
| ¹³ C-1,2,3,6,7,8-HCDF | 13.93 | 13.93 | 13.93 | 13.93 | 13.93 | 13.93 | | 139.4 | |
| ¹³ C-1,2,3,7,8,9-HCDF | 13.93 | 13.92 | 13.93 | 13.93 | 13.92 | 13.93 | 139.4 | | |
| ¹³ C-2,3,4,6,7,8-HCDF | 13.93 | 13.93 | 13.93 | 13.93 | 13.93 | 13.93 | | 139.4 | |
| ¹³ C-1,2,3,4,6,7,8-HCDF | 27.92 | 27.9 | 27.9 | 27.91 | 27.9 | 27.9 | | 278.7 | |
| ¹³ C-1,2,3,4,7,8,9-HCDF | 27.87 | 27.86 | 27.86 | 27.87 | 27.86 | 27.86 | 278.7 | | |
| ¹³ C-1,2,3,4,6,7,8,9- <i>O₈</i> CDF | 27.88 | 27.87 | 27.87 | 27.88 | 27.87 | 27.87 | | 278.7 | |
| ¹³ C-1,2,3,4- <i>T₄</i> CDD | 13.94 | 13.93 | 13.93 | 13.93 | 13.93 | 13.93 | | | 557.4 |

Polycyclic aromatic hydrocarbons (PAHs) - Crystalline PAHs

| Code | Material | Purity |
|----------|---|----------------------------|
| BCR-046 | Benzo[b]chrysene (100 mg) | 0.994 + 0.006 / -0.008 |
| BCR-047 | Benzo[b]fluoranthene (100 mg) | 0.997 4 ± 0.0026 |
| BCR-048R | Benzo[k]fluoranthene (unit size 10 mg) | 0.997 + 0.003 / -0.004 |
| BCR-049 | Benzo[j]fluoranthene (100 mg) | 0.997 + 0.003 / -0.006 |
| BCR-050 | Benzo[e]pyrene (100 mg) | 0.991 + 0.009 / -0.010 |
| BCR-052 | Benzo[ghi]perylene (100 mg) | 0.9923 ± 0.0021 |
| BCR-077R | 1-Methylchrysene (unit size 10 mg) | 0.991 ± 0.007 |
| BCR-078R | 2-Methylchrysene (unit size 10 mg) | 0.993 ± 0.005 |
| BCR-079R | 3-Methylchrysene (unit size 10 mg) | 0.993 ± 0.005 |
| BCR-080R | 4-Methylchrysene (unit size 10 mg) | 0.994 ± 0.004 |
| BCR-081R | 5-Methylchrysene (unit size 10 mg) | 0.9973 ± 0.0013 |
| BCR-082R | 6-Methylchrysene (unit size 10 mg) | 0.9982 + 0.0013 |
| BCR-091 | Anthanthrene (100 mg) | 0.996 ± 0.004 |
| BCR-092 | 10-Azabenz[a]pyrene (100 mg) | 0.996 ± 0.006 |
| BCR-093R | 1-Methylbenz[a]anthracene (unit size 10 mg) | 0.996 ± 0.005 |
| BCR-094 | Dibenz[a,c]anthracene (100 mg) | 0.996 ± 0.004 |
| BCR-095 | Dibenz[a,j]anthracene (100 mg) | 0.9978 ± 0.0025 |
| BCR-096 | DiBenzo[a,l]pyrene (100 mg) | 0.9972 ± 0.0025 |
| BCR-097 | Benzo[a]fluoranthene (100 mg) | 0.996 ± 0.004 |
| BCR-133 | DiBenzo[a,e]pyrene (100 mg) | 0.996 + 0.004 / -0.005 |
| BCR-134 | Benzo[c]phenanthrene (100 mg) | 0.9968 ± 0.0014 |
| BCR-136R | Benzo[b]naphtho[2,3-d]thiophene (unit size 10 mg) | 0.994 ± 0.006 |
| BCR-137R | Benzo[b]naphtho[1,2-d]thiophene (unit size 10 mg) | 0.9966 ± 0.0029 |
| BCR-138 | Dibenz[a,h]anthracene (100 mg) | 0.990 ± 0.007 |
| BCR-139 | Benzo[ghi]fluoranthene (100 mg) | 0.995 ± 0.004 |
| BCR-140 | Benzo[c]chrysene (100 mg) | 0.996 + 0.004 / -0.005 |
| BCR-153R | Dibenz[a,h]acridine (unit size 10 mg) | 0.9992 ± 0.0006 |
| BCR-152 | Dibenz[a,i]acridine (20 mg) | 0.9985 + 0.0010 / -0.0008 |
| BCR-154 | Dibenz[a,j]acridine (100 mg) | 0.9990 + 0.0007 / -0.0010 |
| BCR-155 | Dibenz[a,c]acridine (100 mg) | 0.9991 + 0.0007 / -0.0008 |
| BCR-156R | Dibenz[c,h]acridine (unit size 10 mg) | 0.9936 ± 0.0021 |
| BCR-157 | Benzo[a]acridine (100 mg) | 0.9982 ± 0.0018 |
| BCR-158 | Benzo[c]acridine (100 mg) | 0.9987 + 0.0013 / -0.0018 |
| BCR-159 | Dibenz[a,h]pyrene (100 mg) | 0.9928 ± 0.007 |
| BCR-160R | Flouranthene (unit size 10 mg) | 0.996 + 0.004 / -0.005 |
| BCR-168 | Picene (unit size 10 mg) | 0.998 + 0.001 3 / -0.004 |
| BCR-177R | Pyrene (unit size 10 mg) | 0.9980 ± 0.0004 |
| BCR-265 | Dibenzo[a,e]fluoranthene (20 mg) | 0.9985 + 0.0016 / -0.0010 |
| BCR-266 | 7H-Dibenzo[c,g]carbazole(20 mg) | 0.9971 ± 0.0016 |
| BCR-267 | Indeno[1,2,3-cd]fluoranthene (20 mg) | 0.9986 + 0.000 9 / -0.0008 |
| BCR-269 | Chrysene(20 mg) | 0.9928 ± 0.0028 |
| BCR-270 | Triphenylene (20 mg) | 0.9984 + 0.0010 / -0.0006 |
| BCR-271 | Benzo[a]anthracene (20 mg) | 0.9984 ± 0.0009 |
| BCR-272 | Coronene (20 mg) | 0.9989 + 0.0006 / -0.0004 |