Supplementary materials

Seasonal variability of PM10 chemical composition including 1,3,5-triphenylbenzene, marker of plastic combustion and toxicity in Wadowice, South Poland

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Table S1. Monthly averages, minimal and maximal values of meteorological conditions in sampling period in Wadowice.

| Month    | Temperature [°C] (min – max) | Precipitation [mm] (min – max) | Pressure [hPa] (min – max) | Wind speed [m/s] (min – max) | Prevailing wind direction |
|----------|-----------------------------|--------------------------------|---------------------------|-----------------------------|----------------------------|
| February | 1.5-7                       | 0.0-0.0                        | 969-984                   | 3.4-5                       | SW                         |
| March    | 3-12.5                      | 0.0-0.0                        | 966-991                   | 1.7-6.7                     | W/SW                       |
| April    | 1-15.5                      | 0.2-22.3                       | 973-991                   | 1.3-6.5                     | W/N                        |
| May      | 4.5-21.5                    | 0.2-30.6                       | 971-992                   | 1.5-4.1                     | N                          |
| June     | 14.5-19.5                   | 1.9-7.4                        | 977-986                   | 1.7-4.7                     | W/N                        |
| August   | 13.5-31.5                   | 0.2-29.3                       | 970-982                   | 0.0-4.1                     | W                          |
| September| 9-19.5                      | 1.0-57.8                       | 972-988                   | 1.3-5.6                     | W/E                        |
| October  | 7.5-16                      | 0.1-11.8                       | 961-986                   | 1.0-8.1                     | W                          |
Table S2. Chromatographic and mass spectrometric characterization of target analytes: retention time, mass of characteristic ions and correlation coefficients – R².

| Compound                  | Retention time [min] | Precursor – products ions m/z | R²  | MQL [ng/m³] |
|---------------------------|----------------------|-------------------------------|-----|-------------|
| Naphthalene               | 7.08                 | 128 – 102,                    | 0.9990 | 6.25        |
| Acenaphthylene            | 10.15                | 152 – 150, 126               | 0.9999 | 0.26        |
| Acenaphthene              | 10.43                | 153 – 150, 126               | 0.9998 | 0.02        |
| Fluorene                  | 11.50                | 165 – 163, 139               | 0.9997 | 0.14        |
| Phenanthrene              | 14.03                | 178 – 152, 176               | 0.9991 | 0.29        |
| Anthracene                | 14.11                | 178 – 152, 176               | 0.9996 | 6.25        |
| Fluoranthene              | 17.08                | 202 – 200, 174               | 0.9989 | 0.30        |
| Pyrene                    | 17.82                | 202 – 200, 174               | 0.9998 | 0.12        |
| Benzo(a)anthracene        | 20.81                | 228 – 226, 202               | 0.9977 | 0.38        |
| Chrysene                  | 21.03                | 228 – 226, 202               | 0.9995 | 0.17        |
| Benzo(b)fluoranthene      | 24.23                | 252 – 250, 226               | 0.9945 | 0.56        |
| Benzo(k)fluoranthene      | 24.32                | 252 – 250, 226               | 0.9984 | 0.17        |
| Benzo(a)pyrene            | 26.05                | 252 – 250, 226               | 0.9960 | 0.45        |
| Indeno(1,2,3-cd)pyrene    | 32.83                | 276 – 274, 248               | 0.9943 | 0.80        |
| Dibenz(a,h)anthracene     | 32.84                | 278 – 276, 252               | 0.9941 | 0.78        |
| Benzo(g,h,i)perylenne     | 35.69                | 276 – 274, 248               | 0.9962 | 0.50        |
| 1,3,5-triphenylbenzene    | 35.02                | 306 – 289, 228               | 0.9991 | 0.18        |
| Benzo[a]pyrene-d₁₂        | 25.88                | 264 – 262, 216               | -     | -           |

Figure S1. Time series of monthly average PM10 concentrations during the sampling period.
Table S3. Concentrations of analyzed components constituting to mass closure, collected during the heating and non-heating seasons

| Concentration | Heating season | Non-heating season |
|---------------|----------------|--------------------|
|               | µg/m³          |                    |
| PM10          | min 10.94 max 116.77 average 43.30 | min 10.80 max 53.70 average 27.12 |
| OC            | min 5.90 max 39.32 average 14.46 | min 3.84 max 20.75 average 7.66 |
| EC            | min 1.48 max 6.93 average 3.70 | min 1.08 max 4.64 average 2.11 |
| Na⁺           | min 0.00 max 3.94 average 2.07 | min 1.15 max 2.68 average 1.78 |
| NH₄⁺          | min 0.00 max 5.01 average 1.40 | min 0.26 max 2.45 average 0.92 |
| Mg²⁺          | min 0.00 max 1.07 average 0.37 | min 0.02 max 1.29 average 0.21 |
| K⁺            | min 0.33 max 1.00 average 0.50 | min 0.34 max 0.88 average 0.49 |
| Ca²⁺          | min 0.00 max 3.20 average 0.72 | min 0.02 max 2.63 average 0.81 |
| NO₃⁻          | min 0.62 max 12.04 average 2.52 | min 0.53 max 4.03 average 1.45 |
| SO₄²⁻         | min 2.19 max 13.26 average 5.58 | min 2.24 max 11.81 average 5.35 |
| Cl⁻           | min 0.15 max 9.91 average 1.86 | min 0.15 max 11.92 average 0.57 |
| PAHs [ng/m³]  |                |                    |
| Naphthalene   | <MQL <MQL <MQL | <MQL <MQL <MQL |
| Acenaphthylene| min 0.26 max 1.88 average 0.57 | min 0.27 max 0.90 average 0.54 |
| Acenaphthen    | min 0.02 max 0.11 average 0.02 | min 0.02 max 0.03 average 0.02 |
| Fluorene      | min 0.14 max 1.23 average 0.51 | min 0.15 max 0.57 average 0.16 |
| Phenanthrene  | min 0.42 max 4.17 average 1.44 | min 0.30 max 0.86 average 0.36 |
| Anthracene    | <MQL <MQL <MQL | <MQL <MQL <MQL |
| Fluoranthene  | min 1.07 max 5.52 average 1.60 | min 0.47 max 2.19 average 0.71 |
| Pyrene        | min 0.89 max 20.49 average 4.68 | min 0.41 max 2.24 average 0.71 |
| Benzo(a)anthracene | min 1.60 max 24.73 average 6.98 | min 0.61 max 3.43 average 1.16 |
| Chrysene      | min 1.16 max 21.52 average 6.10 | min 0.50 max 3.23 average 1.08 |
| Benzo(b)fluoranthene | min 1.88 max 19.99 average 6.90 | min 0.95 max 3.72 average 1.63 |
| Benzo(k)fluoranthene | min 1.32 max 10.16 average 3.68 | min 0.54 max 2.15 average 0.89 |
| Benzo(a)pyrene | min 0.49 max 20.93 average 4.98 | min 0.64 max 3.66 average 1.10 |
| Indeno(1,2-cd)pyrene | min 2.50 max 14.18 average 5.86 | min 1.02 max 3.52 average 1.61 |
| Dibenzo(a,h)anthracene | min 1.60 max 20.00 average 6.24 | min 1.17 max 3.59 average 1.43 |
| Benzo(g,h,i)perylene | min 0.51 max 9.25 average 1.82 | min 0.50 max 3.24 average 1.27 |
| 1,3,5-triphenylbenzene | min 0.39 max 2.56 average 0.83 | min 0.26 max 0.90 average 0.30 |
Figure S2. Ring number distribution of PM\textsubscript{10} associated PAHs during heating and non-heating seasons.

Figure S3. Correlation between concentration of 135TPB and temperature through the heating season.

Figure S4. Correlation between concentration of 135TPB and wind speed through the heating season.
Table S4. Characteristic Pearson coefficient.

| PAHs                  | Pearson | Relationship       |
|----------------------|---------|--------------------|
| Acenaphthylene       | 0.76    | Strong relationship|
| Benzo[a]anthracene   | 0.72    | Strong relationship|
| Benzo[a]pyrene       | 0.67    | Moderate relationship|
| Benzo[b]fluoranthene | 0.78    | Strong relationship|
| Benzo[ghi]perylene   | 0.55    | Moderate relationship|
| Benzo[k]fluoranthene | 0.86    | Strong relationship|
| Chrysene             | 0.73    | Strong relationship|
| Dibenzo[a,h]anthracene | 0.76 | Strong relationship|
| Fluoranthene         | 0.38    | Weak relationship   |
| Fluorene             | 0.96    | Very strong relationship|
| Indeno[1,2,3-cd]pyrene | 0.89  | Strong relationship|
| Phenanthrene         | 0.82    | Strong relationship|
| Pyrene               | 0.66    | Moderate relationship|

Table S5. Characteristic diagnostic indicators from different sources (Yunker et al., 2002; Finardi et al., 2017; Kulshrestha et al., 2019; Manoli et al., 2004; Célia A. Alves et al. 2017; Khalili, Scheff and Holsen, 1995; Simoneit, 2015)

| Ratio                  | Value range | Source                          |
|-----------------------|-------------|---------------------------------|
| FLU/(FLU+PYR)         | < 0.5       | Petrol emission                 |
|                       | > 0.5       | Diesel emission                 |
| ANT/(ANT+PHE)         | < 0.1       | Petrogenic emission             |
|                       | > 0.1       | Fuel combustion                 |
| FLT/(FLT+PYR)         | < 0.4       | Petrogenic emission             |
|                       | 0.4 – 0.5   | Fuel combustion                 |
|                       | > 0.5       | Coal and wood burning           |
| BbF/BkF               | 0.92        | Wood burning                    |
|                       | 1.26        | Vehicles                        |
|                       | 2.5 – 2.9   | Smelters                        |
|                       | 3.5 – 3.9   | Coal/COke                       |
| PYR/BaP               | 0.9 ± 0.4   | Gasoline exhaust                |
|                       | 0.8 ± 0.9   | Diesel exhaust                  |
|                       | 0.70        | Wood combustion                 |
| BaP/(BaP+CH)          | 0.08 – 0.39 | Wood burning                    |
|                       | < 0.50      | House heating                   |
|                       | > 0.50      | Mobile sources                  |
| IcdP/(IcdP+BghiP)     | 0.18        | Car                             |
|                       | 0.37        | Diesel exhaust                  |
|                       | 0.56        | Coal                             |
|                       | 0.64        | Wood burning                    |
| BaA/(BaA+CH)          | 0.50        | Vehicles                        |
|                       | 0.73        | Gasoline and diesel exhausts    |