Supporting information for

The Oxidative Potential of Fresh and Aged Elemental Carbon-containing Airborne Particles: A Review

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Supplementary Text 1: The most popular DTT-based protocols for determining the OP of ECCAPs in cited references in this article.

Since metal ions can trigger the decay of DTT chemical reagents, metal chelators Chelex (Cho's protocol, PA) and EDTA (Li's protocol, PB) were initially added into the buffering extraction solution to capture the metal ions before the incubation stage. An apparent difference between those two approaches is that Cho et al. employed trichloroacetic acid (TCA) to terminate the DTT consumption and then injected DTNB to convert the remaining DTT to form 2-nitro-5-thiobenzoic (TNB), which has a large absorption coefficient (14,150 M^{-1} cm^{-1}) at 412 nm[1, 2]. Without using TCA before adding DTNB and they reported that the absorbance of TNB is stable within 2 h due to fast interactions between DTT and DTNB[3]. Therefore, Cho's DTT-based protocol for determining OP brings fewer uncertainties when the number of samples is large and the stock solution (without TCA) needs to be kept for a relatively long time before measurement. While some studies have slight modifications in the extraction solvent, incubation conditions, and the sequence of adding chemical reagents, etc., they almost follow the sequence of single extraction procedure using H_3PO_4 buffering solution (pH=7.3 or 7.4), incubation at 37 ^{o}C (physiologically relevant temperature), and final spectroscopic UV-VIS measurements of 2-nitro-5-thiobenzoic (TNB) at the wavelength of 412 nm. There are also improved methodologies to more precisely capture the overall OP of ECCAPs such as employing multiple extraction procedures containing water, methanol, and dichloromethane (DCM) in the specific orders[4], using high extraction efficiency of Teflon filters in ultrasonic bath[5], the use of more realistic solvent proxy of simulated lung fluid (SLF) to mimic biological tissue environment[6], which take both chemical redox and bioaccessibility into consideration[7].

Table S1. Glossary and Abbreviation Description

Abbreviation	Full Name and Description
1,2-NQ	1,2-naphthoquinone
1,4-NQ	1,4-naphthoquinone
BAA	Benz(a)anthracene
BD	1,1′-biphenyl-2,2′-dicarboxaldehyde
CRY	Chrysene
DEP	Diesel Exhaust Particles
DPF	Diesel Particle Filter
Fresh UBC with 14 nm average size	UBC-Fresh (14 nm)
FS101	Commercial Black Carbon Proxy FS101
FW2	Commercial Black Carbon Proxy FW2
Lab Soot(H)	Lab-produced Soot using Hexane as fuel
Lab Soot(M)	Lab-produced Soot using Methanol as fuel
Lab Soot(P)	Lab-produced Soot using Propane as fuel
Lab Soot(P)-Bz[*e*]p+Ozone	Lab Soot(P)-Coated with benzo[e]pyrene
LGEC	Lab-generated Elemental Carbon
NAP	Naphthalene
A/F	Air/Fuel
PHE	Phenanthrene
PQ	Phenanthrenequinone
Printex 90	Commercial Black Carbon Proxy Printex
PYR	Pyrene
SB4A	Special Black 4A
SB4A-Benzoquinone	SB4A-Coated with Benzoquinone
SOA	Secondary Organic Aerosol
SRM 2975	Commercial Diesel PM (SRM 2975)
SWCNTs	Single-Walled Carbon Nanotubes
SWCNTs-Benzoquinone	SWCNTs-Coated with Benzoquinone
SWCNTs-COOH	SWCNTs functionalized by COOH groups
SWCNTs-OH	SWCNTs functionalized by OH groups
Synthetic Air	Synthetic air with sulfur dioxide, nitrogen dioxide, ozone concentration levels comparable to those in ambient air
UBC	Printex U Black Carbon
UBC(Ozone)+Sulfur Dioxide	UBC treated with ozone and then sulfur dioxide
UBC-1,4-NQ	UBC-Coated with 1,4-NQ
UBC-Benzoquinone	UBC-Coated with Benzoquinone
UBC-Sulfate	UBC-Coated with Sulfate
UD	Ultrasonic Dispersion
Vis	Visible Light Irradiation
WIOC	Water Insoluble Organic Carbon

Table S2. Summary of the Aging Conditions conducted for ECCAPs considered in the review article

ECCAPs Types	Conditions	Features	Ref.
Laboratory-produced Soot (propane)-Air/Fuel (8.83)	Aging-1	150 ± 30 ppb of O_3	8
	Aging-2	Air+ Visible light (480-680 nm)	
	Aging-3	150 ± 30 ppb of O_3+ Visible light (480-680 nm)	
Laboratory-produced Soot (propane)-Air /Fuel (11.77)	Aging-1	150 ± 30 ppb of O_3	8
	Aging-2	Air+ Visible light (480-680 nm)	
	Aging-3	150 ± 30 ppb of O_3+ Visible light (480-680 nm)	
Printex U black carbon (UBC)	Aging-1	100 ppm of O_3 + UV (185 nm)	9
Laboratory-produced Soot(n-hexane)	Aging-1	100 ppm of O_3 + UV (185 nm)	
Diesel Soot	Aging-1	100 ppm of O_3 + UV (185 nm)	
Graphite	Aging-1	100 ppm of O_3 + UV (185 nm)	
Laboratory-produced Soot (propane)-Air/Fuel (8.83)	Aging-1	150 ± 30 ppb of O_3	10
Laboratory-produced Soot (propane)-Air /Fuel (11.77)	Aging-1	150 ± 30 ppb of O_3	
Printex U black carbon (UBC)	Aging-1	Ozonized UBC (64 mg m^{-3}, 2 hr) + SO_2 (86 mg m^{-3}, synthetic air dilution), RH = 40%)- Short Exposure (1 h)	11
	Aging-2	Ozonized UBC (64 mg m^{-3}, 2 hr) + SO_2 (86 mg m^{-3}, synthetic air dilution), RH = 40%)- Long Exposure (6 h)	
Printex U black carbon (UBC)	Aging-1 (2)	[a]Ambient Air (Synthetic Air)	12

SWCNTs Hexane soot Special Black 4A (SB4A)			
	Aging-3	[b]OA/organic Vapors	
	Aging-4	[c]NO_2	
	Aging-5	Zero Air	
	Aging-6	[c]SO_2	
	Aging-7	Toluene	
Laboratory-produced Soot (methane)- Oxygen/Fuel (3.02)	Aging-1	28 ppm of O_3	13
Printex U black carbon (UBC)	Aging-1	100 ppm of O_3, 2h	14
SWCNTs	Aging-1	(37 ± 3) % of RH, 30 ppb of O_3 exposure, 1-7 days	15
	Aging-2	(37 ± 3) % of RH, (0−1.1 × 10^{11} molecules cm^{-3} of ·OH exposure, 1−7 days equivalent ambient exposure	
Lab Soot (Propane)	Aging-1	[d]1.1×10^{12}-1.0×10^{13} molecule cm^{-3} h of O_3	16
	Aging-2	[d]1.0×10^{13}-1.3×10^{13} molecule cm^{-3} h of O_3	
	Aging-3	[d]1.3×10^{13}-1.0×10^{14} molecule cm^{-3} h of O_3	
	Aging-4	[d]Coated with benzo[e]pyrene, 1.1×10^{12}-1.0×10^{13} molecule cm^{-3} h of O_3	
	Aging-5	[d]Coated with benzo[e]pyrene, 1.0×10^{12}-1.3×10^{13} molecule cm^{-3} h of O_3	
	Aging-6	[d]Coated with benzo[e]pyrene, 1.3×10^{13}-1.0×10^{14} molecule cm^{-3} h of O_3	

[a]Aging process 1 exposes black carbon particles to ambient air. Aging process 2 exposes black carbon to synthetic air that contains O_3, SO_2, and NO_2 at concentrations comparable to that found in the ambient air.

[b]The OA-containing air is derived from the oxidation of toluene (about 60 ppb) by OH (produced by photolysis of H_2O_2).

[c]The flow rate in the cylinders reaches a total flow of 2.0 L min^{-1} (76 mL min^{-1} for 1.44 ×10^3 μg m^{-3} SO_2, 5 mL min^{-1} for 1.04 × 10^3

μg m^{-3} NO_2, balanced with zero air).

[d]DTT measurement results of Lab Soot (Propane) upon O_3 exposure of 1.1×10^{12}-1.0×10^{14} molecule cm^{-3} h were divided into three regimes and their values were averaged accordingly.

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