

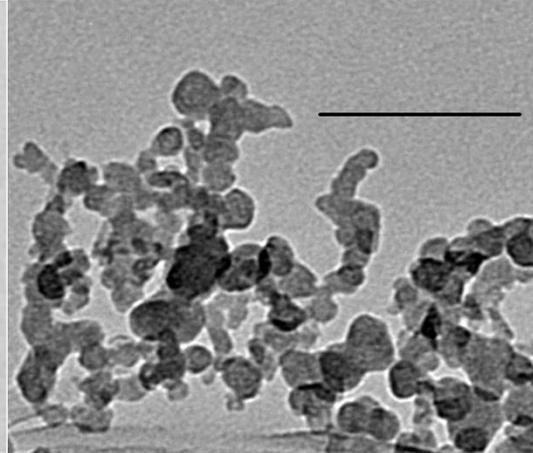
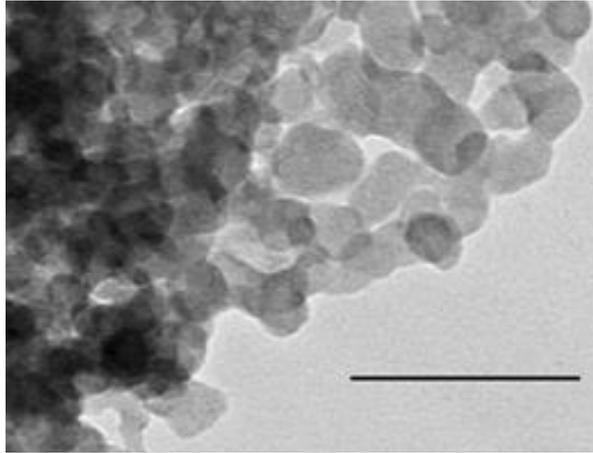
**Combustion-generated carbonaceous urban atmospheric
UFPs: Fuel optimisation in transport and decentralized
electricity economies to minimise their production and
impact**

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Results. Like others we have investigated the size and structure and levels of emission of engine-emitted carbonaceous UFP particles with various tested fuels at 75% load: (a) diesel and (b) water-in-biodiesel emulsion (scale bars = 100nm). For the moment , one can see (c) that formation of emitted carbonaceous particles and NO (d) is lower in Span 80 stabilised water-in-diesel/biodiesel emulsions at all loads.

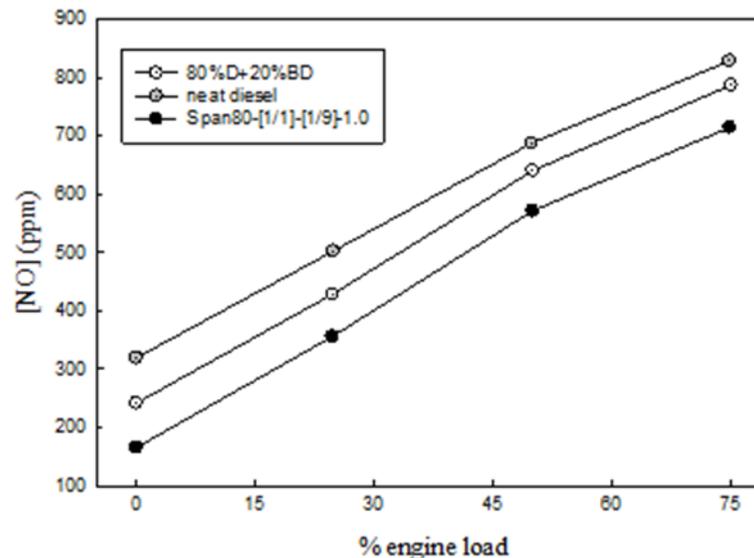
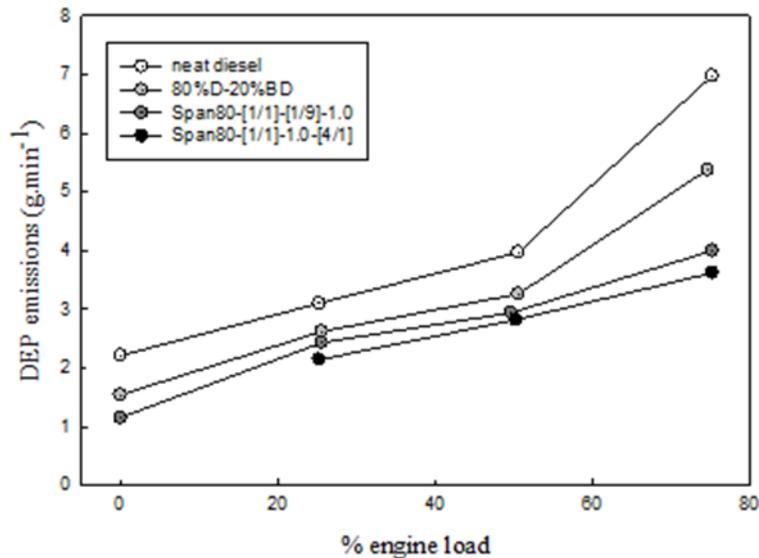
a: diesel (D)



b Span80-stabilised water-in-diesel/biodiesel emulsion

Scale bars = 100nm

c: DEP



d: NO

Discussion. 34% carbonaceous ultrafine particles (UFPs) in the atmosphere come from road transport [1]. Their toxicity increases as the particle size decreases. They are found in urban atmospheres worldwide [2] and aggregate to form larger assemblies. Flames and diesel engines generate nascent single nanoparticles (NPs) ($2 < d < 10 \text{ nm}$; $1.8 < C/H < 2.2$) that are precursors to carbonaceous fractal chain aggregates ($5 < C/H < 10$) and nanotubes [3]. Both adsorb PAHs [4]. Nano-organic carbon (NOC) particles and hydrophobic soot NPs are emitted more from diesel- than gasoline-fuelled vehicles (i.e. the ratio of soot:NOC rises from 0.5 (gasoline engines) to 3.0 (diesel engines)).

Future. We are investigating bioester fuels and injected $\text{H}_2\text{-O}_2$ to control the primary particle size/fractality/PAH passenger load/hydrophobicity/toxicity/impact of carbonaceous UFPs, remembering that carbon is of the seven elements that have changed the world [7]; this work focusses on making its nanoparticle impact (as we transition to a zero-carbon future) only positive. This is part of plans for a decentralized fuel and electricity generation economy.

Many thanks for listening – virtually

References: [1] EU report on UFP emissions (2011); [2] D.Hasenfratz IEEE Internat.Conf.Pervasive Comput.Commun. (PERCOM) 69-77,(2014); [3] A.Evelyn Nano Letts 3,63-64,(2003); [4] R.A.Dobbins Aeros.Sci.Technol. 41,485-496,(2007); [5] P.J.Lawther Thorax 25,525-539,(1970); [6] Harvard Medical School; Jaime Hart; Daily Mail 14th Oct 2014 page 11; [7] J.Browne Seven elements that have changed the world. Weidenfeld and Nicolson (2013)