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Interactive comment on “The effect of metal salts on quantification of elemental and organic carbon in diesel exhaust particles using thermal-optical evolved gas analysis” by Y. Wang et al.

Anonymous Referee #1

Received and published: 8 September 2010

The manuscript deals with the effect of metal (salts) on routine thermo-optical EC/OC determination. While the topics may seem to be important and interesting at the first sight, in fact there are many problems associated with it. On Page 16943 Line 19 the authors claim that ‘a handful of recent studies have suggested’, but in the following paragraphs the authors themselves show that the most of the cited papers are from the 90s, some are even from the early 80s, so the problem is absolutely not new to the aerosol community. In fact, it is as old as the first thermal studies on atmospheric soot. Basically, the authors try to study two separate effects: lowered EC oxidation temperature and increased charring due to the presence of metals. Both effects are well known in the field and have been thoroughly studied for decades. But apart from

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the lack of originality, my most serious concern is the poor atmospheric relevance of the experimental results in several respects.

First, pure diesel particulates are usually not sampled separately in the atmosphere, they always mixed with a suite of other components, especially in TSP. Therefore, it is not particularly relevant that metals significantly lower the EC oxidation temperature of pure diesel emission particulates since EC is always determined in the presence of metals from ambient aerosol. It would have been more interesting how stable the split point is with varying loads of ambient aerosol.

On the other hand, the 'effective' chemical forms of the metals in TSP are more critical but have not been addressed in the manuscript. Among the salts used in the experiments, perhaps sodium chloride is the only one which might be atmospherically relevant, the availability of the others is at least highly questionable. The authors adjust the metal-to-carbon ratio with soluble salts to the bulk concentrations commonly observed in ambient aerosol (TSP), though several of metals in TSP are definitely bound to dust particles largely in their mineral forms which are barely soluble in dilute nitric acid. Even if some metals are present in the ambient TSP which can be liberated and determined following prolonged exposure of the samples to nitric acid, but are the same metals in the same quantities (and chemical forms) similarly available as catalysts for a few seconds in the course of thermal determination? I would doubt so, since different properties and time scales come into play (solubility vs melting point, day vs seconds).

Another concern is that the manuscript relies on only three consecutive daily samples, which do not provide a firm experimental background to draw the conclusions. The experimental method of generating metal salts particles raises additional problems since admittedly crystalline metallic particles form during particle generation (page 16950 line 1) which likely have little if any relevance in atmospheric particles.

Minor comment: The authors quote (e.g. on page 16952) that in biomass burning aerosol EC is combusted at lower temperature because of the presence of metals: in

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fact biomass burning EC in its chemistry and structure is vastly different from diesel particulates.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 16941, 2010.

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10, C7328–C7330, 2010

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