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Interactive comment on "Effect of organic compounds on nanoparticle formation in diluted diesel exhaust" *by* U. Mathis et al.

Anonymous Referee #1

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In this paper the authors investigate the effect of adding vapours of a number of volatile organic compounds upon the subsequent formation of nucleation mode particles in cooling diesel engine exhaust. The work is comprehensively described and the paper generally well written. However, the entire study seems to have been ill conceived.

Presumably, the rationale of this study is to understand the factors influencing nanoparticle formation in diluted engine exhaust, and especially to see whether hydrocarbons present in the engine exhaust are likely to influence that process. If that is the case, then the selection of conditions used for this work was apparently injudicious. Firstly, the authors use a primary dilution ratio of around 8:1. Kittelson has made the point on many occasions that whilst such a ratio is commonly used in engine test bed dilution tunnel work, it grossly underestimates the dilution which occurs during operation of a vehicle and emission to the atmosphere where dilution ratios of around 1000 would be

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more appropriate. The use of dilution ratios of only 8:1 has a tendency to suppress the formation of nucleation mode particles by providing a very large surface area concentration for semi-volatile vapours to condense upon. Work at this dilution ratio is therefore not a good analogy to atmospheric dilution processes. Secondly, recent published and unpublished studies indicate that the compounds most responsible for formation of the nanoparticle mode are medium molecular weight hydrocarbons derived from lubricating oil. In this study, however, relatively low molecular weight compounds have been used which, if present would originate from the fuel rather than from the lubricating oil. Again, there appears to be a very poor parallel between the experiments and the situation in the real world. A further weakness is the use of a diesel fuel with a sulphur content of 323 PPM which is out of line with current concentrations of sulphur in automotive diesel fuel in western Europe. Nanoparticle formation is sensitive to fuel sulphur content. Consequently, the reaction of most workers to this paper will be to ask why the work was done since it is not directly helpful to understanding the nanoparticle formation process nor to formulating control measures.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 227, 2004.