



## **Nanoparticle formation in modern Diesel vehicle exhaust: First measurements of precursor gases and implications for nanoparticles**

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**Modern Diesel vehicles equipped with exhaust after-treatment systems emit only few soot particles and unburned hydrocarbons. However they emit certain trace gases which undergo nucleation and condensation in the rapidly cooling exhaust. This results in the formation of small but numerous nanoparticles which pollute cities and motor ways. Due to their small diameters of about 10 nm they have a high efficiency for intruding the lowest and most vulnerable compartment (alveolar region) of the human lung. Therefore these particles represent a potential health risk. However, only little is known about their formation and chemical nature. Here we report on the first on-line measurements of nucleating and condensing gases present in the hot exhaust of a modern Diesel car. We find that modern exhaust after treatment systems promote the formation of nanoparticles by promoting the formation of nucleating gases. These include strong bases and strong acids. Particularly the key particle precursor gas sulphuric acid is formed, even when low sulphur fuel is used. Among the observed nucleating and condens-**

ing gases are also numerous organics some of which are mutagenic. The small nanoparticles are not considered by present air quality regulations but clearly deserve increased attention.