

CERMET FILTERS FOR DIESEL ENGINE EMISSION REDUCTION

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Diesel engines contribute considerable pollution to our Nation's air-quality problems. Even with more stringent heavy-duty engine standards set to take effect in 2004, these engines will continue to emit large amounts of nitrogen oxides and particulate matter, both of which contribute to public health problems in the United States. The Idaho National Engineering and Environmental Laboratory (INEEL) has invented a self-cleaning, high-temperature cermet filter technology that reduces heavy-duty diesel engine emissions.

A single-step synthesis process forms INEEL's cermet filter technology. Low-cost metal and ceramic powders are mixed with sacrificial filler materials to form a near net shape compact structure. The compact is fired at high temperatures to initiate the synthesis process. The synthesis is complete when all the metal components are reacted, forming the net shape structure. The cermet filter is self-cleaning by continuous or cyclic self-heating. Other properties include its high melting temperatures and its thermal shock resistance. The technology can also destroy CO, H₂, and hydrocarbons in oxidizing condition and is capable of destroying NO_x under reducing conditions. The porosity can be engineered for high-efficiency removal of carbon particulate matter. It has high heat capacity, is lightweight, mechanically strong, and its thermal expansion coefficient is controllable. Under high engine exhaust temperatures, the cermet filter would clean up carbon particles and NO_x simultaneously in the exhaust gas.