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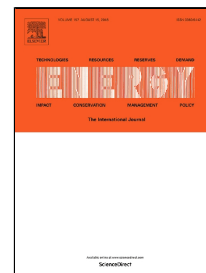
A Theoretical Study on the Effects of Thermal Barrier Coating on Diesel Engine Combustion and Emission Characteristics

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1     **A Theoretical Study on the Effects of Thermal Barrier Coating on**  
2             **Diesel Engine Combustion and Emission Characteristics**

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7     **Abstract**

8             In recent years, thermal barrier coating (TBC) has been used as an effective way  
9     to reduce the heat transfer losses and to improve the thermal efficiency of internal  
10    combustion (IC) engine. In this study, a mathematic model has been proposed by  
11    taking the TBC material parameters into account, which is applied to explore the  
12    effects of TBC on engine combustion and emissions. Details of the combustion  
13    process is analyzed for the coated and uncoated engines under both low and high load  
14    conditions. The result shows that TBC has the ability of reducing wall heat transfer  
15    losses, thus improving the indicated thermal efficiency. A redistribution of different  
16    temperature regions is found with TBC and the coating shows better performance at  
17    rich mixture region due to higher temperature increase rate and at squish region due to  
18    higher surface/volume ratio. Both the soot oxidation process and NO<sub>x</sub> formation  
19    process are accelerated with TBC. However, TBC also enhances the overlap region  
20    between the high soot region and high temperature region, which accelerates the soot  
21    oxidation rate and greatly improves the soot emission.

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