# Viscosity of Oxygenated Fuel: A Simple Model Based on Eyring's Absolute Rate Theory

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Oxygenated fuel is a kind of oxygen-containing fuel [1]. As a fuel additive in diesel engines, oxygenated fuel has been successfully proved to reduce environmental pollutant emissions and improve the combustion efficiency [2]. However, the addition of oxygenated fuel will affect the properties of diesel, so a study on thermophysical properties of oxygenated fuel is highly meaningful for the redesign of diesel engines. Viscosity, as one of the transport properties, can significantly impact the spray characteristics of oxygenated fuel [3]. Therefore, it makes sense to develop a simple and accurate viscosity model for oxygenated fuel. Based on Eyring's absolute rate theory and a cubic equation of state, a viscosity model for oxygenated fuel was proposed in this work. The flow energy was divided into the activation energy and the vacancy formation energy, and a reference state was introduced to simplify the calculation process in the present model. The experimental viscosity data at different temperatures and pressures of oxygenated fuels containing carbonates, ethers, esters, and alcohols were chosen to verify the present model, and the deviations between calculated values and experimental were also estimated. Furthermore, the accuracy effect of the compressibility factor calculation method on the performance of the present model was investigated.