# The Solubility of Combustion Products in Cetane at High Pressures

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**Abstract:**

The urgency to decarbonize the industrial production favors controlled combustion near ambient temperatures which have high thermal efficiency as they dissipate less energy. The diesel fuel reference Cetane is a model fluid for several processes like in enhanced oil recovery, upstream and downstream processes of pre-salt petroleum production and refining, The estimates of solubility of reagents and products of combustion , Oxygen, Nitrogen, Carbon dioxide and Water vapor in cetane are needed for calculating the transport rates across different phases in equilibrium pressure for design and optimization of controlled combustion. Many new processes of synthesis operate at high pressures or conducted in confined spaces like carbon nano tubes where the pressures can reach a thousand bars. There are only few or no experimental phase equilibrium data with cetane, in the pressure range of interest. The objective of present work is to develop specific property estimation methods for each binary system, based on available data. For Oxygen, we use Peng Robinson equation of state PR-EOS-76, estimating binary interaction parameter as a function of temperature from experimental solubility data. For Nitrogen, carbon dioxide and water, the available high-pressure data and our high-pressure measurements are correlated by different polynomials and compared with estimates from PR-EOS-76. The deviations were within experimental error. The methods utilized for estimating solubilities are satisfactory in utilizing available experimental values in the literature.