# A Predictive Thermodynamic Model of Wax Precipitation in Heavy Hydrocarbon Mixtures

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## Abstract

The formation of wax crystals in petroleum fluids, due to decreasing in solubility of the heavy hydrocarbon components causes serious operational problems in the oil industry. A predictive approach to calculating the wax crystallization would help to control the deposition. The objective of this paper is to develop a thermodynamic model that is capable of predicting wax precipitation. The regular solution theory has been modified for the solid – liquid equilibrium modeling. The results are presented and compared to the reported experimental deposition data. It is shown that the model prediction is in an excellent agreement with these data.

**Keywords: Wax; Crude Oil; Deposition**

## Introduction

Heavy hydrocarbon components predominantly paraffins in crude oils and middle distillate fuels may crystallize as a waxy solid phase at low temperatures. Wax deposition that often takes place in oil production, processing and consumption is undesirable. The formation of the solid deposits generally results in reducing the effective sizes of the flowlines and restricts the oil reservoir productivity.

The economic techniques, which are designing to prevent wax precipitation, require a comprehensive knowledge of the wax crystallization phenomenon. Therefore, in recent years a great deal of studies both experimentally and thermodynamic modeling has been conducted on wax deposition. Thermodynamic modeling is an approach to determine solid deposition potential of a waxy fluid at various phase equilibrium conditions. To date many papers have been presented to develop thermodynamic models for prediction of the onset of wax precipitation as well as the amount of the formed solid deposit[1-5, 7, 9 -11]. In spite of the modeling developments achieved, most of them either overestimate the amount of solid wax or are not reliable models to predict experimental results presented by other authors.

In the present paper, the improved regular solution theory model has been used for the solid – liquid equilibrium modeling. A temperature dependence of the binary interaction coefficient