

## Thermodynamics for a sustainable chemical engineering in a changing world

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### ABSTRACT

Applied thermodynamics is of crucial importance in chemical engineering (and other engineering fields like petroleum, biochemical, environmental and materials) with diverse applications. Thermodynamics is often considered to be the "science of optimization" which is much needed when optimizing processes to ensure economical and environmentally-sustainable operations. Thermodynamics is, as mentioned, of importance in very diverse fields ranging from energy, product design, pharmaceuticals and biotechnology, just to mention some of the most important on-going and emerging applications.

While the foundations of thermodynamics are well-established (in most areas), the quest for better thermodynamic models continues, especially for advanced and complex applications.

While classical thermodynamic models are still useful in several practical applications, there is a new generation of thermodynamic models built on the concept of association. These models, known since the early 20<sup>th</sup> century, have become well-known especially over the last 30-40 years and they have offered a unique possibility to use applied thermodynamics in areas and with an accuracy never experienced before.

The presentation will start with an overview of thermodynamic applications and of the most important thermodynamic models which are still in use today. I will subsequently present the novel approaches based on association theories, including also case studies which illustrate the use of diverse thermodynamic models by industry and in practical and demanding applications.