



# Assessment of Safety and Risk with a Microscopic Model of Detonation

*C.-O. Leiber*

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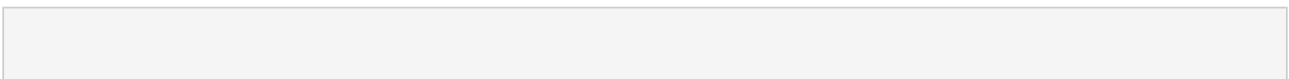
## **Assessment of Safety and Risk with a Microscopic Model of Detonation** C.-O. Leiber

This unique book is a store of less well-known explosion and detonation phenomena, including also data and experiences related to safety risks. It highlights the shortcomings of the current engineering codes based on a classical plane wave model of the phenomenon, and why these tools must fail.

For the first time all the explosion phenomena are described in terms of proper assemblages of hot spots, which emit pressure waves and associated near field terms in flow. Not all of the approaches are new. Some even date back to the 19th century or earlier.. What is new is the application of these approaches to explosion phenomena. In order to make these tools easily available to the current detonation physicist, basic acoustics is therefore also addressed.

Whereas the current plane wave, homogeneous flow detonation physics is an excellent engineering tool for numerical predictions under given conditions, the multi-hot-spot-model is an additional tool for analyzing phenomena that cannot be explained by classical calculations. The real benefit comes from being able to understand, without any artificial assumptions, the whole phenomenology of detonations and explosions. By specifying pressure generating mechanisms, one is able to see that the current treatment of the detonics of energetic materials is only a very special - but powerful - case of explosion events and hazards. It becomes clear that physical explosions must be taken into account in any safety considerations. In these terms it is easy to understand why even liquid carbon dioxide and inert silo materials can explode.

A unique collection of unexpected events, which might surprise even specialists, has resulted from the evaluation of the model. Therefore this book is valuable for each explosion and safety scientist for the understanding and forecasting of unwanted events. The text mainly addresses the next generation of explosion and detonation scientists, with the goal of promoting the science of detonation on a new physical basis. For this reason gaps in current knowledge are also addressed. The science of explosions is not fully mature, but is still in its beginning - and the tools necessary for furthering the understanding of these phenomena have been with us for centuries.



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