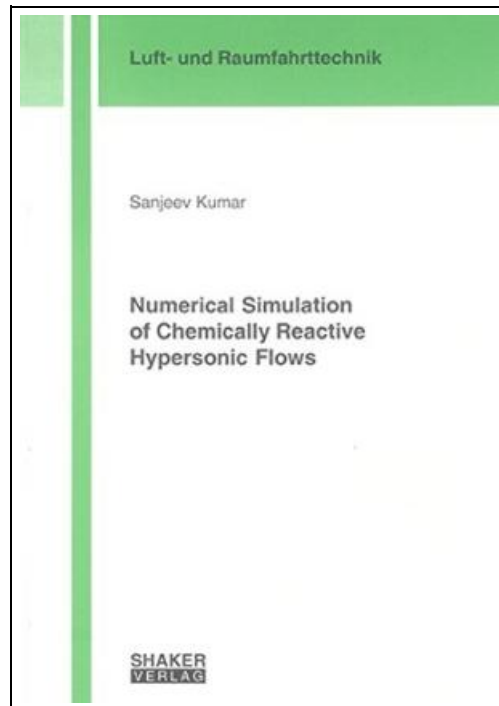


## Numerical Simulation of Chemically Reactive Hypersonic Flows



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## NUMERICAL SIMULATION OF CHEMICALLY REACTIVE HYPERSONIC FLOWS



Shaker Verlag Mai 2006, 2006. Taschenbuch. Condition: Neu. Neuware - To study the atmospheric reentry phase of a space vehicle, it is necessary to understand correctly the thermochemical nonequilibrium processes coupled with the aerodynamic phenomena of this critical phase. In a typical hypersonic flow about a blunt body, the strength of the bow shock is such that the region between the body surface and shock is the site of intensive thermochemical processes. The different internal energy modes of the molecules are far from their equilibrium state. The energy exchanges between these different modes occur according to the individual relaxation time associated to each processes. Detailed physico-chemical models for air in chemical and thermal nonequilibrium are needed for a realistic prediction of hypersonic flow fields. One of the key issues in the design of a hypersonic vehicle is the evaluation of aerodynamic heating. Especially, shock-shock interference heating phenomena is an important and critical problem in the development of air-breathing hypersonic vehicles. Of special interest is the Edney type IV interaction, because it is known to generate the highest local loads in pressure and heat transfer. A number of numerical studies on shock-shock interference problems have been conducted. Most of these studies, however, assume a perfect gas model. For high-enthalpy hypersonic shock-shock interactions, however, real gas effects become important. Real gas effects can have a noticeable impact on flow features, such as shock stand-off distance in a blunt body flow and surface heating rates. Because of their importance, real gas effects have recently been the focus of several studies. An improved understanding of the influences of real gas effects on the shock interaction phenomenon reduces a significant element of risk in the design of hypersonic vehicles. In the framework of the present work, the adaptive CFD code QUADFLOW has been extended for...



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