Preface

Strain is the main tool to boost current and enhance performance of advanced silicon-based metal-oxide-semiconductor field-effect transistors (MOSFETs). Modeling and understanding of strain effects on band structure and mobility has become the important task of modern simulation tools used to design ultra-scaled MOSFETs. This book focuses on modern modeling approaches and methods describing strain in silicon. Contrary to the valence band, strain-induced conduction band modifications have received substantially less attention. Peculiarities of subband structures in thin semiconductor films under stress are investigated in detail using numerical pseudopotential calculations as well as a $\mathbf{k}\cdot\mathbf{p}$ theory, which includes the two lowest conduction bands. Implementation of strain in transport modeling for modern microelectronics design tools is overviewed. Application ranges from device modeling to applied mathematics and software development.

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