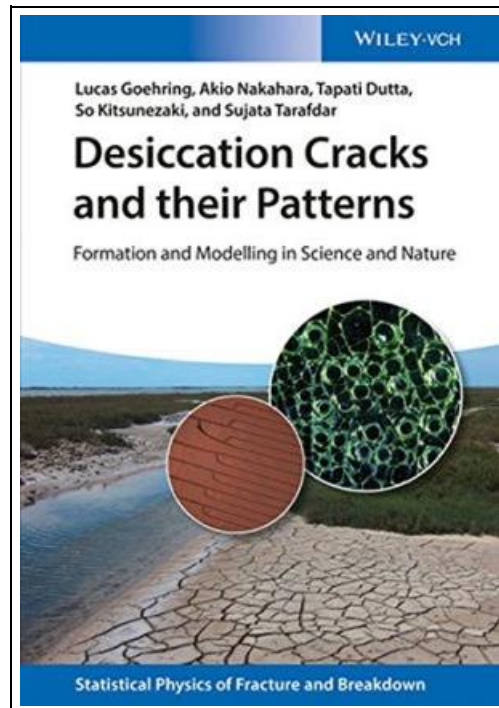


Desiccation Cracks and their Patterns



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(Antonia Orn IV)

DESICCATION CRACKS AND THEIR PATTERNS

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Condition: New. Publisher/Verlag: Wiley-VCH | Formation and Modelling in Science and Nature | Bringing together basic ideas, classical theories, recent experimental and theoretical aspects, this book explains desiccation cracks from simple, easily-comprehensible cases to more complex, applied situations. The ideal team of authors, combining experimental and theoretical backgrounds, and with experience in both physical and earth sciences, discuss how the study of cracks can lead to the design of crack-resistant materials, as well as how cracks can be grown to generate patterned surfaces at the nano- and micro-scales. Important research and recent developments on tailoring desiccation cracks by different methods are covered, supported by straightforward, yet deep theoretical models. Intended for a broad readership spanning physics, materials science, and engineering to the geosciences, the book also includes additional reading especially for students engaged in pattern formation research. | INTRODUCTION Basic Conditions for Crack Formation Linear Elasticity Linear Elastic Fracture Mechanics: Griffith and Irwin Poro-Elasticity Process of Desiccation Drying Regimes, Constant Rate/Falling Rate Periods Water Transport in a Drying Soil: Basics of Capillary Flow and Vapor Transport How Capillary Forces give Rise to Stresses Energy Considerations Driving Force for Cracking during Drying Length Scales: through-Thickness Cracks, Channel Cracks, Interface Cracks, etc. Fracture Saturation - Crack Spacing is similar to Layer Thickness Non-Linear and Dissipative Effects DYNAMICS AND PATTERNS Propagation of a Crack - Crack Velocity - self-affine Structure The Crack Network - 2 dimensional View - self Similarity - fractal Dimension Instabilities: wavy Cracks, en Echelon/en passant Cracks, Star-Cracks, Wing-Cracks, etc. Transition from Dendrites to Fracture Cracks in 3 Dimensions - geological Formations - Cracks in Soil - Cracking versus Peeling Columnar Joints - Desiccation induced analogue produced in the Lab Columnar Joints in Lava and Starch, Summary Scaling: Spacing related to effective Layer Thickness, set by Advection-Diffusion. Ordering - Cracks interact and evolve from Squares to Hexagons. Extensions to other Patterns: Permafrost/polygonal Terrain, evolving Mud Cracks, Surface Cracks in erosional Systems. Practical Applications, estimating Cooling Rate, Conditions...

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