DOWNLOAD PDF CAPILLARITY AND WETTING PHENOMENA

Chapter 1 : Capillarity and Wetting Phenomena : Pierre Gilles De Gennes :

"Capillarity and Wetting Phenomena: Drops, Bubbles, Pearls, Waves is a translation of the earlier French Gouttes, Bulles, Perles et Ondes . It has been wonderfully translated by Axel Reisinger. The English is fully fluent and idiomatic .

Choice Review by P. Douville, emeritus, Central Connecticut State University "You are an intelligent spider sitting on your web. Early morning light forms tiny rainbows as it passes through the beads of dew strung along the filaments composing your hard-earned handiwork. What happened to the water in between each drop? To answer this question, our eight-legged intellectual must first gain an understanding of how liquids such as water actually wet surfaces and why such liquids fail to wet other surfaces. The problem encompasses such subjects as liquids rising up capillary tubes, paint spreading on solid surfaces or liquids spreading on other liquids, the fascinating subject of bubble formation and stability, and why water streams down some surfaces and forms droplets on other surfaces. De Gennes CollAge College de France; Institute Curie , Brochard-Wyart Institut Curie , and QuA c rA c Quere CollAge College de France have written an excellent treatise on these phenomena that opens with a very poetic introduction relating esoteric concepts to everyday observations, and includes chapter references, historical sketches, and a very good discussion of each problem at chapter beginnings. For readers with backgrounds in mathematics, physics, and chemistry, although it is not beyond advanced undergraduates in the sciences and technological fields. Upper-division undergraduates through professionals; two-year technical program students. The range of topics covered and a host of physical ideas and principles the authors describe as guidelines in the field are likely to make this book interesting to a wide audience Shikhmurzaev, Contemporary Physics, Vol. This book brings together almost everything which is known in a single volume. It contains a wealth of practical information about a very large variety of surface phenomena. This book should be of interest to a large variety of scientists not only physicists. It has been wonderfully translated by Axel Reisinger. The English is fully fluent and idiomatic The book can be read with pleasure and profit by the uninitiated, but it is also a valuable - and even an indispensable reference work for the expert. Upper-division undergraduates through professionals: Thus it contains many illuminating examples and sketches In conclusion, the intended readers of this book, whether they be soft matter students or scientists or simply the curious, should find therein not just a very good source of information but also an impressive collection of exciting and simple explanations of very complex phenomena. Roberto Cerbino, Europhysics News, Vol.

Chapter 2 : Capillarity and Wetting Phenomena: Drops, Bubbles, Pearls, Waves by Pierre-Gilles de Genne

As I glance out my window in the early morning, I can see beads of droplets gracing a spider web. The film of dew that has settled on the threads is unstable and breaks up spontaneously into droplets.

Archived from the original on N, folios 11, 67, and Jules Renouard et cie. Joseph and Edward Parker, , volume 10, pp. John Uri Lloyd "References to capillarity to the end of the year ," Archived at the Wayback Machine. On pages 91â€”92, he quotes from this book: He proposed that mosquitoes, butterflies, and bees feed via capillary action, and that sap ascends in plants via capillary action. Vincenzo Giuntini, , pp. Archived at the Wayback Machine. Hall, , pp. Robert Hooke An attempt for the explication of the Phenomena observable in an experiment published by the Right Hon. Robert Boyle, in the 35th experiment of his Epistolical Discourse touching the Air, in confirmation of a former conjecture made by R. James Allestry, , pp. Of small Glass Canes. Recently noted phenomena of narrow capillaries, Honorato Fabri, Dialogi physici Lyon Lugdunum , France: In which the balance and suspension of liquids and mercury is discussed. Antoine Molin, , pages ff Archived at the Wayback Machine. Montanario opposita circa elevationem Humoris in canaliculis, etc. Adrian Vlacq, , pages 3â€”7 Archived at the Wayback Machine. Philosophical Transactions of the Royal Society of London, Self-published , , pages â€” Francis Hauksbee "An account of an experiment touching the ascent of water between two glass planes, in an hyperbolick figure," Philosophical Transactions of the Royal Society of London, Josia Weitbrecht "Tentamen theoriae qua ascensus aquae in tubis capillaribus explicatur" Archived at the Wayback Machine. Theoretical essay in which the ascent of water in capillary tubes is explained , Commentarii academiae scientiarum imperialis Petropolitanae Memoirs of the imperial academy of sciences in St. Josia Weitbrecht "Explicatio difficilium experimentorum circa ascensum aquae in tubis capillaribus" Archived at the Wayback Machine. Explanation of difficult experiments concerning the ascent of water in capillary tubes , Commentarii academiae scientiarum imperialis Petropolitanae Memoirs of the imperial academy of sciences in St. In , Christlieb Ehregott Gellert â€” observed that like mercury, molten lead would not adhere to glass and therefore the level of molten lead was depressed in a capillary tube. Gellert "De phenomenis plumbi fusi in tubis capillaribus" On phenomena of molten lead in capillary tubes Commentarii academiae scientiarum imperialis Petropolitanae Memoirs of the imperial academy of sciences in St. Gaspard Monge â€” investigated the force between panes of glass that were separated by a film of liquid. Monge proposed that particles of a liquid exert, on each other, a short-range force of attraction, and that this force produces the surface tension of the liquid. David fils, , Chapitre X. On the elevation or depression of liquids in capillary tubes , pages â€” Philosophical Magazine, series 4, 42 Conclusions [drawn] from capillary phenomena , Annalen der Physik, 3:

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Chapter 3 : Wetting - Wikipedia

Capillarity and Wetting Phenomena, like every text and paper bearing the name of de Gennes is intuitive, insightful, elegant, beautiful and extremely useful text.

Weak Strong Figure 2: Wetting of different fluids: A shows a fluid with very little wetting, while C shows a fluid with more wetting. A has a large contact angle, and C has a small contact angle. The contact angle is determined by the balance between adhesive and cohesive forces. As the tendency of a drop to spread out over a flat, solid surface increases, the contact angle decreases. Thus, the contact angle provides an inverse measure of wettability. For water, a wettable surface may also be termed hydrophilic and a nonwettable surface hydrophobic. This is sometimes referred to as the " Lotus effect ". Similarly, the terms omniphobic and omniphilic apply to both polar and apolar liquids. Traditionally, solid surfaces have been divided into high-energy solids and low-energy types. The relative energy of a solid has to do with the bulk nature of the solid itself. Most molecular liquids achieve complete wetting with high-energy surfaces. The other type of solids is weak molecular crystals e. Depending on the type of liquid chosen, low-energy surfaces can permit either complete or partial wetting. For example, a surface presenting photon-driven molecular motors was shown to undergo changes in water contact angle when switched between bistable conformations of differing surface energies. William Zisman produced several key findings: This critical surface tension is an important parameter because it is a characteristic of only the solid. Knowing the critical surface tension of a solid, it is possible to predict the wettability of the surface. Differences in wettability between surfaces that are similar in structure are due to differences in the packing of the atoms. For instance, if a surface has branched chains, it will have poorer packing than a surface with straight chains. Lower critical surface tension means a less wettable material surface. Ideal solid surfaces[edit] An ideal surface is flat, rigid, perfectly smooth, and chemically homogeneous, and has zero contact angle hysteresis. Zero hysteresis implies the advancing and receding contact angles are equal. In other words, only one thermodynamically stable contact angle exists. When a drop of liquid is placed on such a surface, the characteristic contact angle is formed as depicted in Fig. Furthermore, on an ideal surface, the drop will return to its original shape if it is disturbed. Minimization of energy, three phases[edit] Figure 3: In equilibrium , the net force per unit length acting along the boundary line between the three phases must be zero. The components of net force in the direction along each of the interfaces are given by:

Chapter 4 : Capillary action - Wikipedia

Capillarity and Wetting Phenomena: Drops, Bubbles, Pearls, Waves is a translation of the earlier French Gouttes, Bulles, Perles et Ondes by the same authors, which was published in by Editions Belin-Herscher (Paris) as part of the series Collection Ã‰chelles.

Chapter 5 : Capillarity and Wetting - Inteligent Soft-Materials

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