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(54) Title: MOLECULAR TAILORING OF SURFACES (57) Abstract This invention describes a new approach to three-dimensional molecular tailoring of surfaces. In this process, a plasma deposition step is initially employed to deposit reactive functional groups on the surface of a solid substrate. This is then followed by immersion of the coated substrate in a solution during which time solute molecules react with the functional surface groups introduced during the plasma process. Solute molecules are attached to the surface during this second step. This simple two-step process is of general utility in that both the nature of the plasma introduced surface group and the nature of the solute molecules can be varied. Additionally it is possible to provide exact control of the surface density of reactive groups introduced during the plasma process and thus the concentration of solute molecules coupled to the solid surfaces. A particularly significant aspect of this invention is that the second step chemical derivatization reactions can be carried out using aqueous solutions at room temperature. The RF plasma polymerization of substituted perfluorohexenes is shown to produce films having unusually high -CF₃ content. These films are produced under both pulsed and continuous-wave plasma deposition conditions. The relative -CF₃ content of these polymers increases with decreasing average RF power absorbed during the film formation processes. The films produced under the least energetic condition (i.e., pulsed plasma, 0.1 ms on/3.0 ms off and 100 watts peak power) are exceptionally hydrophobic, exhibiting advancing and receding water contact angles in excess of those observed with Teflon® surfaces. The most hydrophobic films have a -CF₃ content which represents 40 % of the carbon atoms present in the sample.		