**Interaction of Metallo-Carboxyphenyl Porphyrins with Rutile and Anatase $TiO_2$**

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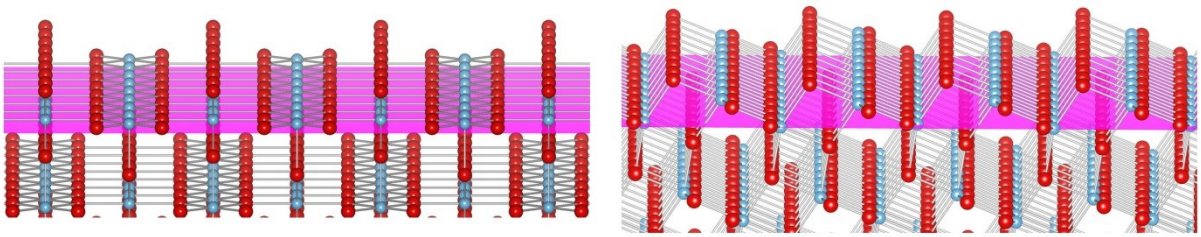
Dye-sensitized titanium dioxide is of great interest for photocatalysis and photovoltaics. The structure of the deposited monolayer and the configuration of the single molecules within such layers are of great importance for the device performance. It is therefore necessary to understand the sensitization process and the interaction of single molecules with the surface and among the molecules. In our work we focused mainly on the interaction of metallo-carboxyphenyl porphyrins with the rutile (110) and anatase (101) surface. In order to assess the adsorption configurations of different porphyrins and their electrical properties, we used atomic force and Kelvin probe force microscopy at room temperature. We found that even though the chemical composition of the two surfaces is identical, the adsorption behavior is completely different, indicating that it depends on the surface structure of the substrate. On rutile (110) the evaporated porphyrins aligned themselves with respect to the bridging oxygen rows on the surface, resulting in two main orientations. For anatase (101), exhibiting a similar surface structure, the same porphyrins did hardly bind on the terraces but rather stuck to the step edges. The insight of our work is critically discussed with respect to the formation processes of monolayers and their application in dye-sensitized solar cells.



Rutile $TiO_2$ (110) Anatase $TiO_2$ (101)

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