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Rock and Mineral Surface Modifications - Chemical, Mechanical and Biological

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Three mechanisms (1) mechanical attack by force of wind and water (2) chemical solution, and (3) mechanical (bioerosion) and chemical (biocorrosion) changes produced by biofilm growth contribute to the wear-down process of mineral and rock surfaces under different environmental conditions. It is, however, difficult to attribute the surface changes to a specific environment or process.

Quartz sand grains that have been exposed to subaerial and subaquatic conditions were analysed concerning traces of aeolian, aquatic and biological weardown. Topographic imaging of the grain surfaces by Atomic Force Microscopy (AFM) under standardized experimental conditions was done. Quantitative topographical parameters of surface variations were extracted by non-linear methods derived from digital image analysis. These parameters were examined by multi-variate statistic, yielding three well distinguishable groups.

This way it is possible to differentiate the surface changes dominated by subaerial, subaquatic and biological impact. The method may also be used for the detection of aeolian, subaquatic, and even biological modification of extant and former extraterrestrial rock sites.

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