Crystal surface dynamics

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Engineering at the nanoscale, which is the basis for the development of modern technologies, requires precise control on the processes of layer by layer crystal growth, and on the nanostructure formation. The key role in understanding and controlling of these processes is the crystal surface dynamics. Depending on the growth parameters, the surface dynamics leads to the formation of various structures of interest for further applications. The aim of the thesis will be the theoretical examination and analysis of surface processes using different theoretical models. In particular, the following processes will be investigated: surface diffusion, surface reconstruction, step meandering and step bunching. The best description can be obtained by combining various research techniques, such as Monte Carlo models, cellular automata and solution of appropriate differential equations. The basic tool in this work is a computer. The programming skills will be necessary. The conclusions drawn on the basis of such studies: emerging structures, phase diagrams, scaling laws can be compared with the results obtained in various laboratories in Poland and abroad. Ultimately the developed programs will be helpful in designing crystal structures of a given pattern, content and properties.