

SEQUENCE-SPECIFIC BOUND NANOPARTICLES FOR A NOVEL SUB-WAVELENGTH DNA RESTRICTION TECHNOLOGY BASED ON LASER PULSE ENERGY CONVERSION

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KEY WORDS: DNA, restriction, laser, metal nanoparticles, gold, metaphase chromosomes

DNA restriction is a basic method in today's molecular biology. Thereby DNA is digested by sequence specific restriction enzymes, and the length distribution of the resulting fragments is detected by gel electrophoresis. Differences in the sequence lead to different restriction patterns. A disadvantage of this standard method is the limitation to a small set of fixed sequences, so that the assay can not be adapted to any sequence of interest (e.g. SNP).

We designed a scheme for DNA restriction in order to provide access to any desired sequence, based on laser light conversion on sequence-specific positioned metal nanoparticles. Especially gold nanoparticles are known for their interesting optical properties caused by plasmon resonance. The resulting absorption can be used to convert laser light pulses into heat, resulting in nanoparticle destruction. We work on the combination of this principle with DNA-modification of nanoparticles and the sequence-specific binding (hybridization) of these DNA-nanoparticle complexes along DNA molecules. Different mechanisms of light-conversion were studied, and the destructive effect of laser light on the nanoparticles and DNA is demonstrated.

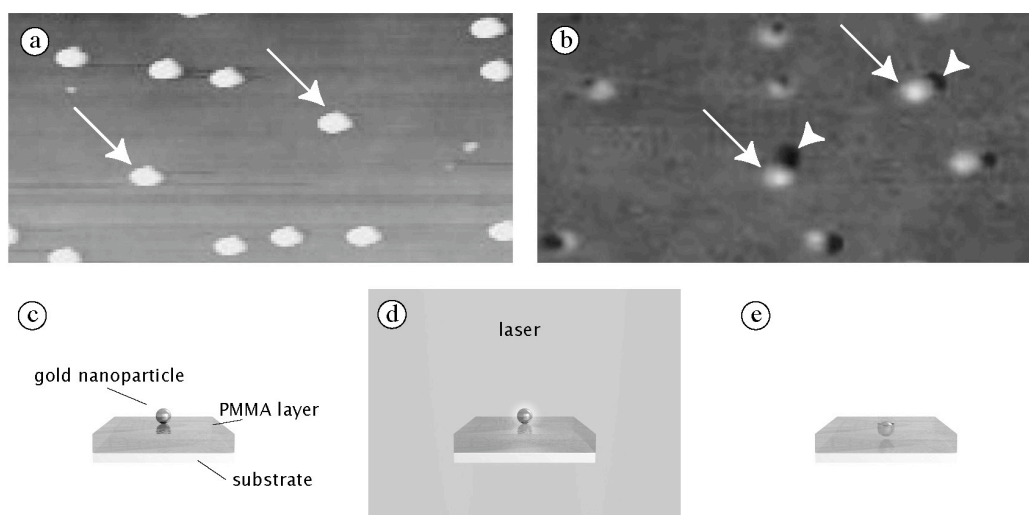


Figure: Characterization of the energy conversion on metal nanoparticles using heat-sensitive polymeric layers of PMMA. a,b) AFM images before (a) and after (b) laser irradiation of the sample. c-d) Scheme of experimental setup