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Novel and fast method of gene mutation identification using Surface Enhanced Raman Spectroscopy (SERS)

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An early and accurate diagnosis of specific DNA mutations has a decisive role for effective treatment. Especially, when an immediate decision on treatment most needs to be made, the rapid and precise confirmation of clinical findings is vital. Herein, we show a new strategy for the gene mutation (BRAF c.1799T>A; p. V600E) identification using highly SERS-active and reproducible SERS substrate (photo-etched GaN covered with a thin layer of sputtered gold) and surface enhanced Raman scattering (SERS) spectroscopy. The detection is based on the conformation change (gauche → trans) of the alkanethiol linker modifying the capture DNA during the hybridization process. The value of the intensity ratio of the ν(C–S) bands of the trans and gauche conformer higher than 1.0 indicated the presence of mutation. The demonstrated new DNA SERS (bio)sensor is characterized by the low detection limit at the level of pg/μL, wide analytical range from 6.75 pg/μL to 67.5 ng/μL and high selectivity. The proposed bioactive platforms, based on nanostructured GaN substrates modified with thiolated ssDNA (single stranded DNA) can be successfully used in the analysis of clinical samples.

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