Instant nanodots grow on silicon to form sensing array

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Scientists have shown that it is now possible to simultaneously create highly reproductive three-dimensional silicon oxide nanodots on micrometric scale silicon films in only a few seconds. Xavier Landreau and his colleagues at the University of Limoges, France, demonstrated in their paper to be published in EPJD[1] that they were able to create a square array of such nanodots, using regularly spaced nanoindents on the deposition layer, that could ultimately find applications as biosensors for genomics or bio-diagnostics.

They used a process called atmospheric pressure plasma-enhanced chemical vapour deposition. This approach is a much faster alternative to methods such as nanoscale lithography, which only permits the deposition of one nanodot at a time. It also improves upon other silicon oxide growth processes that do not make it possible to precisely order the nanodots into an array. In addition, it can be carried out at atmospheric pressure, which decreases its costs compared to low-pressure deposition processes.

One of the authors' goals was to understand the self-organization mechanisms leading to a preferential deposition of the nanodots in the indents. By varying the indents' interspacing, they made it comparable to the average distance travelled by the silicon oxide particles of the deposited material. Thus, by adapting both the indents' spacing and the silicon substrate temperature, they observed optimum self-ordering inside the indents using atomic force microscopy.

The next step in their research will be to investigate how such nanoarrays could be used as nanosensors. They plan to develop similar square arrays on metallic substrates in order to better control the driving forces that produce the highly ordered self-organisation of nanodots. Further research will be needed to give sensing ability to individual nanodots by associating them with probe molecules designed to recognise target molecules to be detected.

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