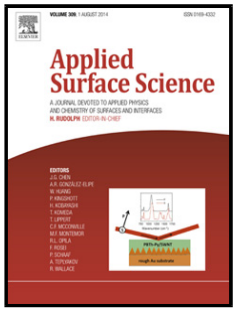

Title: Controllable fabrication of large-area 2D colloidal crystal masks with large size defect-free domains based on statistical experimental design

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fabrication of large-area 2D colloidal crystal masks with large size defect-free domains based on statistical experimental design

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ABSTRACT: A large-area hexagonal packed monolayer of silica spheres with consistent defect-free domains of a size larger than 3000 μm^2 was prepared by spin coating on glass substrates with the assistance of experimental design and statistical analysis. The ratio of the defect-free monolayer area to the square of sphere diameter is nearly two times of the previously reported maximum values. Several parameters involved in the spin coating systems were investigated. The results indicated that the relative humidity and the rotational speed of the first step of the spin-coating had the most important impact on the ordering degree of the prepared monolayer. Furthermore, the ordering degree of the obtained monolayer increased with a decreased relative humidity. In addition, it reached an optimal value when the first rotational speed during spin coating reached a value of 1000 rpm. From this study, it can be concluded that statistical experimental design is an efficient strategy, especially for multi-factor phenomenon studies.