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Analysis of Crystalline Structure of Synthetic Opals Based on Their AFM Scans DARKHAN TUYENBAYEV, LILIANA RUIZ DIAZ, MALIK RAKHMANOV, Department of Physics and Astronomy, University of Texas at Brownsville — Synthetic opals are made of silica nano spheres by means of self-assembly techniques. Formation of the opals is a somewhat random process and can lead to different close-packed crystalline structures and defects. In most cases the opals form the face centered cubic lattice and sometimes the hexagonal close packed lattice. Moreover, the opals consist of multiple domains and can have various crystalline defects. To study the structure of opals at the nano scale we analyze their surfaces with Atomic Force Microscope (AFM). We developed an algorithm to analyze the profile of the scanned surfaces and separate adjacent packing layers from which we obtain the positions of the individual silica nano spheres. This technique allows us to determine the crystalline structure of the opal domains, the presence of defects within the structure, and assess the uniformity of the opal sample. The results of this analysis can be used for optical characterization of opals and other nano structured materials.

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