

TOPOLOGY AND GEOMETRY OF AMORPHOUS STRUCTURES

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Description of amorphous structures has been a long-standing problem. What is lacking there is an appropriate language to describe geometric structures including short-range order (SRO) and medium-range order (MRO). In this talk, we present new computational topological methods to this problem: (1) persistence modules on commutative ladders, and (2) continuations of point clouds by persistence diagrams. These methods elucidate the following new geometric features in amorphous structure: (i) persistence of MRO rings in silica glasses under pressurizations, and (ii) presence of 1-parameter deformations connecting specific packing states (FCC, HCP, 5-rings, etc) in three dimensional granular packing experiments.