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Annealing glasses by cyclic shear deformation and vibration modeled by a 2-D granular system: study of the effect of shear amplitude¹ FRANCISCO LOPEZ GONZALEZ, ANA MARIA HERRERA GONZALEZ, Instituto de Ciencias Basicas e Ingenieria de la Universidad Autonoma del Estado de Hidalgo-AACTyM, FERNANDO DONADO PEREZ, Instituto de Ciencias Basicas e Ingenieria de la Universidad Autonoma del Estado de Hidalgo-AAMF — This work proposes a slightly tilted bidimensional vibrated hard-sphere system, periodically sheared via deformations, for modeling glass to crystal transitions. Specifically, the system, initially in random closed packed (RCP) state modeling an amorphous solid, rearranges into a hexagonal closed packed (HCP) crystal configuration. The vibration is fixed in amplitude and frequency, so it models a constant temperature. The shearing is achieved by periodical deformations of a deformable rhomboidal shape boundary based on a four-bar mechanism. To measure the time evolution of the annealing, the sixth-bond-orientational-order parameter ψ_6 is measured during 42 cycles of shearing. We report the results of 7 experimental cases where the maximum deformation shear amplitude is varied. We found correlations between shear amplitude with the average of the sixth-bond-orientational-order parameter. The results indicate complex oscillatory hexagonal order dynamics determined by the cyclic perturbation. These oscillations are analyzed by first and second-order linear regressions finding correlations between the sheared boundary's acceleration with the rate of change of ψ_6 . Furthermore, images of the hexagonal crystal grains during its annealing are presented.

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