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Elastic Properties of Graphene Nanomeshes ASHWIN RAMASUBRAMANIAM, Department of Mechanical and Industrial Engineering, University of Massachusetts, Amherst, CORINNE CARPENTER[1], Department of Chemical Engineering, University of Massachusetts, Amherst, ANDRE MUNIZ, Department of Chemical Engineering, Federal University of Rio Grande do Sul, Brazil , DIMITRIOS MAROUDAS, Department of Chemical Engineering, University of Massachusetts, Amherst — We report results on the elastic properties of graphene nanomeshes following a systematic analysis based on molecular-statics and molecular-dynamics simulations of uniaxial tensile deformation tests according to reliable bond-order classical interatomic potentials. Elastic properties are determined as a function of the nanomesh architecture, including the regular arrangement of pores in the nanomesh (pore lattice structure), pore morphology, nanomesh density (ρ), and pore edge passivation. We report scaling laws for the density dependence of the elastic modulus M and find that M scales with the square of the density, consistently with other cellular materials, for circular unpassivated pores over the range of temperature and nanomesh architectural parameters examined. We find that pore edge passivation strengthens the elastic moduli. The effects of passivation and pore morphology, namely, the aspect ratio of elliptical pores, on the $M(\rho)$ scaling laws are analyzed in detail.

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