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Added mass of porous solids oscillating in dense gas[1] XIAOLONG YIN, SIRADON PRATEEPSWANGWONG, KEERTHANA KRISHNAN, Colorado School of Mines — Oscillation frequency of an object submerged in fluid is usually detectably retarded by the mass of co-accelerated fluid. In this study, this added-mass effect is explored for porous solids oscillating in dense gas, using an enclosed spring-mass system at high pressures. Compared with a non-porous solid of the same shape, the added mass of a porous solid is always higher because of pore-residing gas. When the period of oscillation is much greater than the time of viscous relaxation inside the pores, pore-residing gas follows the motion of the porous solid, and its mass can be estimated using the difference in the added mass between porous and non-porous solids. Experiments conducted using Berea sandstone show that masses of pore-residing gas obtained from oscillations were in good agreement with those calculated using pore volume of the sandstone and gas densities. Added mass of porous solids observed from oscillations can therefore serve to give pore volume when gas density is known, or gas density when pore volume is known. Additional added mass was noticed, however, when mesoporous solids (nanoporous silica and rocks) were used with a condensable gas.

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