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Dense packings of spheres in cylinders ADIL MUGHAL,
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HUTZLER, AARON MEAGHER, Trinity College Dublin — We develop
a simple analytical theory that relates dense hard sphere packings in a
cylinder to corresponding disk packings on its surface. It applies for ra-
tios R=D/d (where d and D are the diameters of the hard spheres and
the bounding cylinder, respectively) up to R=2.738. Within this range
the densest packings are such that all spheres are in contact with the
cylindrical boundary. The detailed results elucidate extensive numerical
simulations by others and ourselves by identifying the nature of various
competing phases. We also present results for the regime R greater than
2.738. These preliminary results explore packings that include internal
spheres (i.e. spheres that do not contact the cylinder). This is done
through a combination of experiments and numerical simulation (simu-
lated annealing). Our experiments involve the packing of monodisperse
bubbles in narrow micron-sized capillaries. Such "wet foams" are an
excellent model of the hard sphere packing problem and are analyzed by
X-ray tomography to provide structural information.

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