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Thin shell vesicles composed of hydrophilic plate-like nanoparticles ANAND SUBRAMANIAM, School of Engineering and Applied Sciences, Harvard University, JIANDI WAN, Department of Mechanical and Aerospace Engineering, Princeton University, ARVIND GOPINATH, Fischer School of Physics, Brandeis University, HOWARD STONE, Department of Mechanical and Aerospace Engineering, Princeton University — Nanopowders of graphene oxide, montmorillonite and laponite spontaneously delaminate into ultrathin nanoscopic plates when dispersed in water. These plates, which are typically $\sim$ 1 nm thick and microns in lateral dimension, have found many uses as precursors to graphene, ceramics, layer-by-layer structures, and as structural modifiers of nanocomposites. Here we show that mechanical forces due to shear in a narrow gap can assemble hydrophilic plate-like particles on air bubbles, forming stable nanoplated armored bubbles. Translucent inorganic vesicles (vesicles defined here as closed thin-shelled structures with the same liquid inside and outside) of these particles are produced when the nanoplated armored bubbles are exposed to common water-miscible organic liquids and surfactants. These inorganic vesicles are mechanically robust, have walls that are about six nanometres thick, and are perforated with pores of submicron dimensions. We characterize the phenomenon and find that a wetting transition at the scale of the nanoparticles is the primary mechanism of formation. The discovery of these novel inorganic structures raises a wealth of questions of fundamental interest in materials and surface science.

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