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Direct Imaging of a Two-Dimensional Silica Glass on Graphene P.Y. HUANG, Cornell University, S. KURASCH, University of Ulm, A. SRIVASTAVA, V. SKAKALOVA, Max Planck Institute for Solid State Research, J. KOTAKOSKI, A.V. KRASHENINNIKOV, University of Helsinki, R.M. HOVDEN, Q. MAO, Cornell University, J.C. MEYER, University of Vienna, J. SMET, Max Planck Institute for Solid State Research, D.A. MULLER, Cornell University, U. KAISER, University of Ulm — Large-area graphene substrates [1] are a promising lab bench for synthesizing and characterizing novel low-dimensional materials such as two-dimensional (2D) glasses. Unlike 2D crystals such as graphene, 2D glasses are almost entirely unexplored-yet they have enormous applicability for understanding amorphous structures, which are difficult to probe in 3D. We report direct observations of the structure of an amorphous 2D silica supported on graphene. To our knowledge, these results represent the first discovery of an extended 2D glass. The 2D glass enables aberration-corrected scanning transmission electron microscopy and spectroscopy, producing the first atomically-resolved experimental images of a glass. The images strikingly resemble Zachariasen's seminal 1932 cartoons of a 2D continuous random network glass [2] and allow direct structural analyses not possible in 3D glassy materials. DFT calculations indicate that van der Waals interactions with graphene energetically favor the 2D structure over bulk SiO₂, suggesting that graphene can be instrumental in stabilizing new 2D materials. [1] J. C. Meyer et al., Nature 454, 319–322 (2008). [2] W. H. Zachariasen, Pinshane Y. Huang J. Am. Chem. Soc. **54**, 3841–3851 (1932). Cornell University

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