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Diffraction imaging with electrons from an ultracold plasma source S.D. SALIBA, D.V. SHELUDKO, A.J. MCCULLOCH, M. JUNKER, S.C. BELL, H.M. QUINEY, R.E. SCHOLTEN, ARC Centre of Excellence for Coherent X-ray Science, The University of Melbourne VIC 3010, Australia — The molecular structure of biological molecules such as bacteriorhodopsin can be determined by electron diffraction, but general application has been limited by the brightness of conventional electron sources. Brightness is proportional to current and inversely proportional to electron temperature. A high brightness electron source from cold atom clouds presents a promising alternative to traditional high temperature (104 K) sources. Cold atoms in a MOT can be photoionized just above threshold, releasing electron bunches with temperatures as low as 10 K. Although the number of electrons that can be extracted from a MOT is relatively small, the reduced temperature may enable brightness competitive with conventional alternatives. We have simulated electron diffraction from electron microscopy grids and 2D arrays of simple molecules, exploring the energy, coherence and brightness requirements for practical diffraction imaging.

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