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Investigating the DC conductivity of compressed C-H and C-H-O mixtures using ultrafast terahertz pulses

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Dynamically shock compressing plastics like polystyrene [PS, $(C_8H_8)_n$] or polyethylene terephthalate [PET, $(C_{10}H_8O_4)_n$] to Mbar pressures accesses a regime with peculiar phenomena, like carbon de-mixing and subsequent formation of diamond crystallites [1,2] or the predicted appearance of metallic hydrogen [3], that are expected to impact conductivity. An accurate understanding of DC conductivity for materials at warm dense matter conditions is widely relevant to planetary modelling [4,5,6] and inertial confinement fusion efforts [5,7]. Previous studies used visible or x-ray probes, which measure the high-frequency response, and extrapolated to the DC value [5,8,9]. This extrapolation is model-dependent and prone to inaccuracies [5]. In contrast, THz spectroscopy directly probes the electrical conductivity without relying on models [5]. THz pulses are sufficiently low frequency to measure DC-like transport properties, while still being short enough to act as an ultrafast probe [5]. This work, carried out at the Jupiter Laser Facility at the Lawrence Livermore National Laboratory, uses THz spectroscopy to measure the electrical conductivity of shocked PS and PET. Paired with established Doppler velocimetry and the published equations of state for PS [10] and PET [11], various pressure-temperature states in and around the diamond formation region [2], as well as the proposed hydrogen insulator-to-metal transition region [12], were studied and resulting conductivities will be presented.

[1]: Kraus et al., Nat Astron 1, 606–611 (2017).
[2]: He et al., Sci. Adv. 8, eabo0617 (2022).
[3]: Kraus, et al., Phys. Rev. Research 5, L022023 (2023).
[4]: Helled et al., Philos Trans A Math Phys Eng Sci 378, 20190474 (2020).
[5]: Ofori-Okai et al., Phys. Plasmas 31, 042711 (2024).
[6]: French et al., ApJS 202, 5 (2012).
[7]: Lindl, Phys. Plasmas 2, 3933–4024 (1995).
[8]: Millot et al., Science 347, 418-420 (2015).
[9]: Sperling et al., Phys. Rev. Lett. 115, 115001 (2015).
[10]: Barrios et al., Phys. Plasmas 17, 056307 (2010).
[11]: Lütgert et al., Sci Rep 11, 12883 (2021).
[12]: McWilliams et al., Phys. Rev. Lett. 116, 255501 (2016).

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