Chau *et al.* Reply: The issue raised by Bastea [1] is an important one; namely, are fluid oxygen, nitrogen, and hydrogen diatomic, monatomic, or a mixture of both when their electrical conductivities reach minimum metallic conductivity at 100 GPa (1 Mbar) pressures, compressions of 4 to 10 times liquid densities, and several 1000 K [2]? Ultimately, this question must be answered experimentally, and this is yet to be done. In the absence of a direct experimental answer and based on the current knowledge, we now believe that these fluids are probably monatomic or nearly so. This position is contrary to our earlier belief that these fluids are probably diatomic [3,4]. The assumption of total dissociation is completely consistent with what is known about all three molecules. The thermodynamic states reached in [2–4] were done so with an initial, relatively weak, single shock followed essentially by isentropic compression to final pressure. Hydrogen [5], oxygen [6], and nitrogen [7] systematically [8] undergo substantial dissociation under single-shock compression in the range ~20 to ~60 GPa. Oxygen reaches much higher temperatures than the other two, and its dissociation energy is similar to that of hydrogen. Signatures of dissociation under the single shock are observed experimentally in deuterium and nitrogen when $E_d/k_BT \sim 0.1$, where E_d is dissociation energy at density, k_B is Boltzmann's constant, and T is temperature [8]. As density and temperature are increased by isentropic compression, substantially more dissociation is expected to occur. For example, at metallization of hydrogen and nitrogen, $E_d/k_BT \geq 0.1$, which suggests total dissociation. Since the temperatures of oxygen are higher, it also is probably totally dissociated [9]. Recent *ab initio* calculations on oxygen [10] are not in agreement with our experiments [3]. This work did not attempt to calculate densities and temperatures reached in our experiments, and their calculated conductivities are higher at lower densities than the experiments. The inconsistency between quantum molecular dynamics simulations of Mazevet [11] and the double shock experiments on nitrogen [7] was in the value of the Gruneisen parameter and not whether nitrogen dissociates. The most recent studies by the Los Alamos group on nitrogen, as well as hydrogen and oxygen, show that all three of these fluids undergo a continuous transition from a molecular fluid to a dissociated fluid in agreement with our work [9]. There are no inconsistencies in our Mott scaling parameter. The values we give are completely consistent with using effective Bohr radii from Ref. [25] of [2] for N and O and using the exact value for H, as outlined in our Letter. The Comment author is correct that the value of the Mott scaling parameter will change if the effective Bohr radii from Ref. [26] of [2] is used instead. The definition of atomic radii is fuzzy as best. However, our purpose is to compare the relative behavior between different atoms. As long as a consistent set of values for the effective Bohr radius is used, our comparison is valid albeit the absolute values of the Mott scaling parameter may change. There is no doubt that nitrogen, as well as oxygen and hydrogen, displays many different and complex behaviors at different pressures and temperatures. However, the examples cited by Bastea are under ambient conditions or high static pressures at ambient (or lower) temperatures in the solid. The experimental data at high pressure and temperatures in these fluids show that these systems are actually rather similar. Our work on the electrical conductivity gives a simple picture that is consistent with the known experimental data.

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