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Experimental evaluation of opacity in the deep solar interior using the concept of "microscopic equivalence." YAIR KURZWEIL, GIORA HAZAK, NRCN, Israel, JAMES BAILEY, TAISUKE NAGAYAMA, Sandia National Lab, USA — A problem for stellar astrophysics is that existing opacity models have been called into question both by experiments [1] and by solar model comparisons with helioseismology, but an alternative opacity model does not yet exist. Importantly, the experiments measured opacity only for iron, at 182 eV – 195 eV temperatures (T_e) comparable to the value at ˜0.7. Experimental validation of opacity models at higher T_e and density (n_e) are required to understand the entire Sun. Unfortunately, controlled transmission measurements at the required conditions are extremely difficult to achieve at lab. We propose to help resolve this dilemma using experiments at achieved conditions combined with the "microscopic equivalence" principle. Thus, using this principle, we can use a lower-atomic-number surrogate element to test opacity model physics important for iron at higher T_e and n_e than can be reached in present experiments. Theoretical modeling to evaluate this idea, using the CRSTA[2,3]/PRCRSTA [4] models will be discussed. [1] J. E. Bailey *et al*, *Nature* **517**, 56 (2015). [2] G. Hazak and Y. Kurzweil, High Energy Density Phys., 8, 290 (2012). [3] Y. Kurzweil and G. Hazak, High Energy Density Phys. 9, 548 (2013). [4] Y. Kurzweil and G. Hazak, Phys. Rev. E 94 053210 (2016).

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