Contribution ID: **49** Type: **not specified**

Properties of non-cryogenic DTs and their relevance for fusion

Wednesday 25 June 2025 09:40 (40 minutes)

In inertial confinement fusion, pure deuterium-tritium (DT) is usually used as a fusion fuel. In their paper, S. Y. Guskov et al. [Plasma Phys. Rep. 37, 1020 (2011)] instead propose using low-Z compounds that contain DT and are non-cryogenic at room temperature. They suggest that these fuels can be ignited for $\varrho_{DT}R > 0.35$ g/cm^2 and $kT_e > 14$ keV, i.e., parameters that are more stringent but still in the same order of magnitude as those for DT. In deriving these results, Guskov et al. assume that ionic and electronic temperatures are equal and consider only electronic stopping power. Here, we show that at temperatures greater than 10 keV, ionic stopping power is not negligible compared to the electronic one. We demonstrate that this necessarily leads to higher ionic than electronic temperatures. Both factors facilitate ignition, showing that non-cryogenic DT compounds are more versatile than previously known. In addition, we find that heavy beryllium borohydride ignites more easily than heavy beryllium hydride, the best-performing fuel found by Guskov et al. Our results are based on an analytical model that incorporates a detailed stopping power analysis, as well as on numerical simulations using an improved version of the community hydro code MULTI-IFE. Alleviating the constraints and costs of cryogenic technology and the fact that non-cryogenic DT fuels are solids at room temperature opens up new design options for fusion targets with Q >100. The discussion presented here generalizes the analysis of fuels for energy production.

Primary author: Prof. RUHL, Hartmut (University of Munich)

Presenter: Prof. RUHL, Hartmut (University of Munich)