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Comment

Comment on "Time-resolved hydrino continuum transitions with cutoffs at 22.8 nm and 10.1 nm"

by R.L. Mills and Y. Lu, Eur. Phys. J. D 64, 65-72 (2011)

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Claims of hydrino detection in the recent publication entitled "Time-resolved hydrino continuum transitions with cutoffs at 22.8 nm and 10.1 nm" by Mills and Lu and in earlier papers coauthored by Mills (e.g. as referenced by Mills and Lu) involve observations on low pressure hydrogen discharge plasmas [1]. The proposed hydrinos are hydrogen atoms in levels described by Rydberg's formula but with principal quantum numbers $n = 1/k$, $k = 2, 3, \ldots, 137$. The existence of such levels is totally inconsistent with elementary quantum mechanics based on Schrödinger's equation. There is no substantive theoretical justification for the proposed hydrinos. The claims for such levels are based largely on observations of various phenomena in low pressure hydrogen discharge plasmas. Although numerous interesting phenomena in discharge plasmas have been interpreted as evidence for hydrinos, many of these phenomena already have alternate explanations, for example those described by Phelps [2].

Rather than propose alternate explanations for a steadily expanding list of phenomena in discharge plasmas, we here suggest another approach for testing the hydrino hypothesis: assume that the hydrino hypothesis is correct and see with the aid of statistical mechanics whether this is consistent with various laboratory, astrophysical, and cosmological studies. Statistical mechanics is based on one very simple postulate that all energetically accessible states of an isolated system are equally probable in equilibrium. The validity of statistical mechanics is supported by all credible observations and experiments.

The spectroscopic data used by Mills and Lu as evidence for the production of hydrinos indicates that the collisional rate constants for proposed hydrino formation are of similar magnitude to excitation rate constants for a variety of radiating atom and ion levels. Specifically the spectrally integrated continuum signals in their Figure 3e are comparable to, or greater than, the spectrally integrated line intensities. There are suggestions that hydrino production reactions have substantial activation energies but the atomic kinetic energies required are still in the range found in low pressure discharge plasmas. It is claimed that hydrino formation occurs at easily detectable rates in small gas samples (masses in the $\sim10^{-7}$ g range) with observations times in the range of 1 s ($\sim10^{-7}$ year).

Although low pressure discharge plasmas are typically non-equilibrium systems, higher pressure (>1 bar) laboratory scale discharge plasmas often operate in near equilibrium as described, for example, by Brown [3]. The phrase local thermodynamic equilibrium (LTE) is used to describe such high pressure plasmas and it implies that level populations are collisionally equilibrated, but the radiation energy density is below that of a Planck distribution at the temperature of the level populations. The collisional reaction rate constants suggested by the spectroscopic data of Mills and Lu are large enough for high pressure hydrogen plasmas to come to equilibrium. The higher temperatures in the electrode regions of high pressure hydrogen discharge plasmas would overcome significant activation energies for the proposed hydrino formation reactions. There are no reports of high pressure hydrogen plasmas collapsing into hydrinos with a burst of hard ultraviolet radiation and X-rays.

In nature there are mostly-hydrogen plasmas of sufficiently high temperature and density and with very long lifetimes that should have a thermal equilibrium concentration of hydrinos. Stars, including the Sun, are an obvious example. Much work has gone into the dependence of the properties of stars on their elemental composition as described in the introductory text by Zeilik and Gregory [4]. An example is the calculation of the central temperature of the Sun, in order to predict nuclear

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reaction rates. These rates agree with the Sun's radiative power output and with neutrino observations of recent decades. Models of the Sun's interior are also in agreement with observations of solar acoustic oscillations. An equilibrium concentration of hydrinos would greatly alter these results on the Sun's interior. Furthermore, the easily observed surface or photosphere of the Sun is a very well studied mostly-hydrogen weakly-ionized plasma in LTE at 5800 K. If hydrinos existed, their LTE density in the photosphere would be vastly higher than the density of ordinary hydrogen. There is no evidence of an LTE concentration of hydrinos in the solar photosphere in either spectroscopic observations or solar wind studies.

The largest thermal equilibrium and mostly-hydrogen plasma of all was the expanding Universe in the epoch from nucleon freeze out until electron-ion recombination, also described in the introductory text by Zeilik and Gregory [4]. The existence of hydrino atoms is incompatible with our understanding of Big Bang Cosmology. Recombination would have occurred much earlier and at much higher temperature. Almost no ordinary hydrogen atoms would have survived. The deep levels with $n \geqslant 1/137$ proposed by Mills and Lu lead to electron-ion recombination only shortly after nucleon freeze-out. The hydrino hypothesis leads to many other problems in Big Bang Cosmology.

Hydrinos as proposed by Mills and Lu are inconsistent with laboratory scale high pressure LTE hydrogen plasmas, inconsistent with the stability and structure of stars including the Sun, and inconsistent with the known Universe.

References

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