Chapter 5

HYDRINO THEORY – BLACKLIGHT PROCESS

DISPROPORTIONATION OF ENERGY STATES

Since the products of the catalysis reactions (e.g. Eqs. (5.48-5.51)) have binding energies of $m \cdot 27.2 \ eV$, they may further serve as catalysts. Thus, further catalytic transitions may occur: $n = \dfrac{1}{3} \rightarrow \dfrac{1}{4}, \ \dfrac{1}{4} \rightarrow \dfrac{1}{5}$, and so on. Thus, lower-energy hydrogen atoms, *hydrinos*, can act as catalysts by resonantly and nonradiatively accepting energy of $m \cdot 27.2 \ eV$ from another H or hydrino atom (Eq. (5.24)). The process can occur by several mechanisms: metastable excitation, resonance excitation, and ionization energy of a hydrino atom is $m \cdot 27.2 \ eV$ (Eq. (5.24)). The transition reaction mechanism of a first hydrino atom affected by a second hydrino atom involves the resonant coupling between the atoms of m degenerate multipoles each having $27.2 \ eV$ of potential energy. (See the Energy Hole as a Multipole Expansion section).

The energy transfer of $m \cdot 27.2 \ eV$ from the first hydrino atom to the second hydrino atom causes the central field of the first to increase by m and the electron of the first to drop m levels lower from a radius of $\dfrac{a_H}{p}$ to a radius of $\dfrac{a_H}{p+m}$. The second lower-energy hydrogen is excited to a metastable state, excited to a resonance state, or ionized by the resonant energy transfer. The resonant transfer may occur in multiple stages. For example, a nonradiative transfer by multipole coupling may occur wherein the central field of the first increases by m, then the

electron of the first drops m levels lower from a radius of $\dfrac{a_H}{p}$ to a radius of $\dfrac{a_H}{p+m}$ with further resonant energy transfer. The energy transferred

by multipole coupling may occur by a mechanism that is analogous to photon absorption involving an excitation to a virtual level. Or, the energy transferred by multipole coupling during the electron transition of the first hydrino atom may occur by a mechanism that is analogous to two-photon absorption involving a first excitation to a virtual level and a second excitation to a resonant or continuum level [29-31]. Similarly to the case with H as the catalyst, the transition energy greater than the energy transferred to the second hydrino atom may appear as a characteristic light emission in a vacuum medium or extraordinary fast H.

The transition of the hydrino intermediate from its radius to the corresponding hydrino radius gives rise to continuum radiation. By time reversal symmetry, the hydrino can serve as a catalyst to accept the energy difference between its state and a corresponding intermediate state at the radius of the intermediate wherein the decay to the hydrino radius releases the transferred energy. The release may be as continuum radiation or fast H.

For example, $H\left[\dfrac{a_H}{p'}\right]$ may serve as a source of energy holes for $H\left[\dfrac{a_H}{p}\right]$. In general, the transition of $H\left[\dfrac{a_H}{p}\right]$ to $H\left[\dfrac{a_H}{p+m}\right]$ induced by a resonance transfer of $m \cdot 27.2 \ eV$ (Eq. (5.24)) with a metastable state excited in $H\left[\dfrac{a_H}{p'}\right]$ is represented by

$$m \cdot 27.2 \ eV + H\left[\frac{a_H}{p'}\right] + H\left[\frac{a_H}{p}\right] \rightarrow H*\left[\frac{a_H}{p'}\right] + H*\left[\frac{a_H}{p+m}\right] + m \cdot 27.2 \ eV \tag{5.62}$$

$$H*\left[\frac{a_H}{p'}\right] \rightarrow H\left[\frac{a_H}{p'}\right] + m \cdot 27.2 \ eV \tag{5.63}$$

$$H*\left[\frac{a_H}{p+m}\right] \rightarrow H\left[\frac{a_H}{p+m}\right] + \left[(p+m)^2 - p^2\right] \cdot 13.6 \ eV - m \cdot 27.2 \ eV \tag{5.64}$$

where p, p', and m are integers and the asterisk represents an excited metastable state. And, the overall reaction is

$$H\left[\frac{a_H}{p}\right] \to H\left[\frac{a_H}{p+m}\right] + [(p+m)^2 - p^2] \cdot 13.6 \ eV \tag{5.65}$$

The short-wavelength cutoff energy of the continuum radiation given by Eq. (5.57) is the maximum energy release of the hydrino intermediate as it decays. For example, both the reaction of H with $H\left[\frac{a_H}{p'}\right]$ as the source of an energy hole of $3 \cdot 27.2 \ eV$ to form $H\left[\frac{a_H}{4}\right]$ and the reaction of $H\left[\frac{a_H}{5}\right]$ with $H\left[\frac{a_H}{p'}\right]$ as the source of an energy hole of $27.2 \ eV$ to form $H\left[\frac{a_H}{6}\right]$ gives rise to a cutoff of 10.1 nm ($122.4 \ eV$) wherein the magnitude of the potential energy of $H\left[\frac{a_H}{p'}\right]$ is greater than $m \cdot 27.2 \ eV$ for each case.

In another mechanism, the transition of $H\left[\frac{a_H}{p}\right]$ to $H\left[\frac{a_H}{p+m}\right]$ induced by a multipole resonance transfer of $m \cdot 27.2 \ eV$ (Eq. (5.24)) and a transfer of $[(p')^2 - (p'-m')^2] \cdot 13.6 \ eV - m \cdot 27.2 \ eV$ with a resonance state of $H\left[\frac{a_H}{p'-m'}\right]$ excited in $H\left[\frac{a_H}{p'}\right]$ is represented by

$$H\left[\frac{a_H}{p'}\right] + H\left[\frac{a_H}{p}\right] \to H\left[\frac{a_H}{p'-m'}\right] + H\left[\frac{a_H}{p+m}\right] + [((p+m)^2 - p^2) - (p'^2 - (p'-m')^2)] \cdot 13.6 \ eV \tag{5.66}$$

where p, p', m, and m' are integers.

In two other mechanisms, the hydrino atom that serves as the source of the energy hole may be ionized by the resonant energy transfer. Consider the transition cascade for the pth cycle of the hydrogen-type atom, $H\left[\frac{a_H}{p}\right]$, with the hydrogen-type atom, $H\left[\frac{a_H}{p'}\right]$, that is ionized as the source of energy holes that causes the transition. The equation for the absorption of an energy hole of $m \cdot 27.2 \ eV$ (Eq. (5.24)) equivalent to the binding energy of $H\left[\frac{a_H}{p'}\right]$, is represented by

$$m \cdot 27.2 \ eV + H\left[\frac{a_H}{p'}\right] + H\left[\frac{a_H}{p}\right] \rightarrow H^+ + e^- + H*\left[\frac{a_H}{p+m}\right] + m \cdot 27.2 \ eV \tag{5.67}$$

$$H*\left[\frac{a_H}{p+m}\right] \rightarrow H\left[\frac{a_H}{p+m}\right] + \left[(p+m)^2 - p^2\right] \cdot 13.6 \ eV - m \cdot 27.2 \ eV \tag{5.68}$$

$$H^+ + e^- \rightarrow +H\left[\frac{a_H}{1}\right] + 13.6 \ eV \tag{5.69}$$

And, the overall reaction is

$$H\left[\frac{a_H}{p'}\right] + H\left[\frac{a_H}{p}\right] \rightarrow H\left[\frac{a_H}{1}\right] + H\left[\frac{a_H}{(p+m)}\right] + \left[2pm + m^2 - p'^2 + 1\right] \cdot 13.6 \ eV \tag{5.70}$$

wherein $m \cdot 27.2 \ eV = p'^2 \cdot 13.6 \ eV$.

Alternatively, the energy transfer may affect the potential energy of the acceptor rather than the total energy. The energy transfer from a first hydrogen-type atom $H\left[\frac{a_H}{p}\right]$ to a second acceptor hydrogen-type atom $H\left[\frac{a_H}{p'}\right]$ serving as a catalyst causes the electric potential energy of the acceptor hydrogen-type atom to become zero, and the energy conservation gives rise to a hot proton with the ionization of the energy acceptor hydrogen-type atom. The transition reaction equation for the pth cycle transition cascade of the hydrogen-type atom, $H\left[\frac{a_H}{p}\right]$, with the hydrogen-type atom, $H\left[\frac{a_H}{p'}\right]$, that is ionized with the absorption of an energy hole of $m \cdot 27.2 \ eV$ (Eq. (5.24)) equivalent to its potential energy, is represented by

$$m \cdot 27.2 \ eV + H\left[\frac{a_H}{p'}\right] + H\left[\frac{a_H}{p}\right] \rightarrow H^+_{fast} + e^- + H*\left[\frac{a_H}{p+m}\right] + m \cdot 27.2 \ eV \tag{5.71}$$

$$H*\left[\frac{a_H}{p+m}\right] \rightarrow H\left[\frac{a_H}{p+m}\right] + \left[(p+m)^2 - p^2\right] \cdot 13.6\ eV - m \cdot 27.2\ eV \qquad (5.72)$$

$$H_{fast}^+ + e^- \rightarrow H\left[\frac{a_H}{1}\right] + (m+1) \cdot 13.6\ eV \qquad (5.73)$$

And, the overall reaction is

$$H\left[\frac{a_H}{p'}\right] + H\left[\frac{a_H}{p}\right] \rightarrow H\left[\frac{a_H}{1}\right] + H\left[\frac{a_H}{(p+m)}\right] + \left[2pm + m^2 - m + 1\right] \cdot 13.6\ eV \qquad (5.74)$$

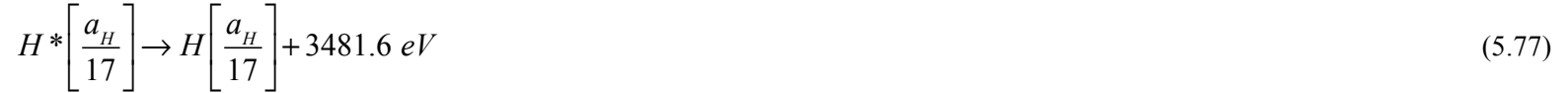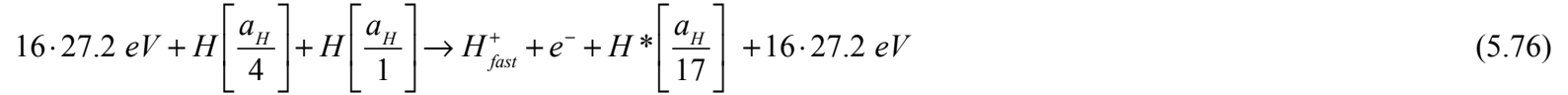wherein $m \cdot 27.2\ eV = p'^2 \cdot 27.2\ eV$. Consider all stable states of hydrogen and their ability to serve as a source of energy holes regarding a general reaction involving a transition of hydrogen to a lower-energy state caused by another hydrogen or hydrino. In the case that H is the source of energy hole involving either mechanism (Eq (5.70) or Eq. (5.74)), the reaction is given by

$$H(1/p') + H(1/p) \rightarrow H + H(1/(m+p)) + \left[2pm + m^2 - p'^2 + 1\right] \cdot 13.6\ eV \qquad (5.75)$$

where p, p', and m are integers with $m = p' = 1$.

The laboratory results of the formation of hydrinos with emission of continuum radiation has celestial implications. Hydrogen self-catalysis and disproportionation may be reactions occurring ubiquitously in celestial objects and interstellar medium comprising atomic hydrogen. Stars are sources of atomic hydrogen and hydrinos as stellar wind for interstellar reactions wherein very dense stellar atomic hydrogen and singly ionized helium, He^+, serve as catalysts in stars. Hydrogen continua from transitions to form hydrinos matches the emission from white dwarfs, provides a possible mechanism of linking the temperature and density conditions of the different discrete layers of the coronal/chromospheric sources, and provides a source of the diffuse ubiquitous EUV cosmic background with a 10.1 nm continuum matching the observed intense 11.0-16.0 nm band in addition to resolving the identity of the radiation source behind the observation that diffuse $H\alpha$ emission is ubiquitous throughout the Galaxy and widespread sources of flux shortward of $912\ \mathring{A}$ are required. Moreover, the product hydrinos provides resolution to the identity of dark matter [8-9].

Disproportionation reactions of hydrinos are predicted to given rise to features in the X-ray region. As shown by Eqs. (5.40-5.43) the reaction product of HOH catalyst is $H\left[\dfrac{a_H}{4}\right]$. Consider a likely transition reaction in hydrogen clouds containing H_2O gas wherein the first hydrogen-type atom $H\left[\dfrac{a_H}{p}\right]$ is an H atom and the second acceptor hydrogen-type atom $H\left[\dfrac{a_H}{p'}\right]$ serving as a catalyst is $H\left[\dfrac{a_H}{4}\right]$. Since the potential energy of $H\left[\dfrac{a_H}{4}\right]$ is $4^2 \cdot 27.2\ eV = 16 \cdot 27.2\ eV = 435.2\ eV$, the transition reaction is represented by

$$16 \cdot 27.2\ eV + H\left[\frac{a_H}{4}\right] + H\left[\frac{a_H}{1}\right] \rightarrow H^+_{fast} + e^- + H*\left[\frac{a_H}{17}\right] + 16 \cdot 27.2\ eV \tag{5.76}$$

$$H*\left[\frac{a_H}{17}\right] \rightarrow H\left[\frac{a_H}{17}\right] + 3481.6\ eV \tag{5.77}$$

$$H^+_{fast} + e^- \rightarrow H\left[\frac{a_H}{1}\right] + 231.2\ eV \tag{5.78}$$

And, the overall reaction is

$$H\left[\frac{a_H}{4}\right] + H\left[\frac{a_H}{1}\right] \rightarrow H\left[\frac{a_H}{1}\right] + H\left[\frac{a_H}{17}\right] + 3712.8\ eV \tag{5.79}$$

The extreme-ultraviolet continuum radiation band due to the $H*\left[\dfrac{a_H}{p+m}\right]$ intermediate (e.g. Eq. (5.72) and Eq. (5.76)) is predicted to have a short wavelength cutoff and energy $E_{\left(H \rightarrow H\left[\frac{a_H}{p+m}\right]\right)}$ given by

$$E_{\left(H \to H\left[\frac{a_H}{p+m}\right]\right)} = \left[(p+m)^2 - p^2\right] \cdot 13.6 \ eV - m \cdot 27.2 \ eV$$

$$\lambda_{\left(H \to H\left[\frac{a_H}{p+m}\right]\right)} = \frac{91.2}{\left[(p+m)^2 - p^2\right] \cdot 13.6 \ eV - m \cdot 27.2 \ eV} \ nm$$

(5.80)

and extending to longer wavelengths than the corresponding cutoff. Here the extreme-ultraviolet continuum radiation band due to the decay of the $H*\left[\frac{a_H}{17}\right]$ intermediate is predicted to have a short wavelength cutoff at $E = 3481.6 \ eV$; $0.35625 \ nm$ and extending to longer wavelengths. A broad X-ray peak with a 3.48 keV cutoff was recently observed in the Perseus Cluster by NASA's Chandra X-ray Observatory and by the XMM-Newton [32-33] that has no match to any known atomic transition. The 3.48 keV feature assigned to dark matter of unknown identity by BulBul et al. [32] matches the $H\left[\frac{a_H}{4}\right] + H\left[\frac{a_H}{1}\right] \to H\left[\frac{a_H}{17}\right]$ transition and further confirms hydrinos as the identity of dark matter.

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