Lost Mass in Chemical Reactions

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Hi fans,

Media coverage for the 100th anniversary of Einstein's "annus mirabilis" has been attracting my attention.

The BBC's "Horizon" TV program did a good job of establishing that the equation E=mc^2 simply calculates the amount of energy contained in any amount of matter, such as the pencil sitting on your desk. Weigh it, multiply its mass (expressed in kg) by 3x10^8 (speed of light in m/s) twice, and you get the amount of energy contained in that pencil (expressed in joules).

I still get people who think that in order to understand E=mc^2 you have to imagine all kinds of instances where objects are travelling at fantastic speeds. The pencil sitting on your desk isn't travelling at a fantasctic speed (at least not relative to you it isn't). It's just sitting there constituting an amount of energy which is equal to its mass according to E=mc^2.

Unfortunately the "Horizon" program did rather imply that the only kind of physical process in which "matter" is converted into useful (or perhaps dangerous) amounts of "energy" according to the relation E=mc^2 is in those processes involving the splitting of atoms or atomic nuclei.

And of course there are lots of us who know that this is untrue.

" Consider the combustion of a mole of methane, ... the only way in which energy can be released is if the products of the reaction have a smaller mass than the reactants .... "

(from "Chemistry" by Steven S Zumdahl, Houghton Mifflin Company, 1977 − see:

http://www.yk.psu.edu/~jhb3/cotw06.htm

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Mass is lost.

It does not disappear from the Universe.

It is simply dissipated to the surroundings in alternative forms of energy, and it no longer contributes to the masses of the molecules which make up the products of the reaction.

For the benefit of anyone who may still be in doubt about this I would re−iterate that in order to grasp the true meaning of E=mc^2, and to gain an accurate scientific understanding of the physical nature of the world we live in, it is necessary to recognise that the mass of the products of ANY exothermic chemical reaction must be less than the mass of the reactants.

Keith P Walsh