Not so very cool

M. Simon, Technical Contributor

A recent press release at ECN, NTU research embraces laser and sparks cool affair [1], prompted me to go looking for the source of the report, which was an article in Nature Magazine [2]. The article explains a lot of things. One of those things is that the cooler is not the panacea described in the press release.

> Here we report a net cooling by about 40 kelvin in a semiconductor using group-II–VI cadmium sulphide nanoribbons, or nanobelts, starting from 290 kelvin. We use a pump laser with a wavelength of 514 nanometres, and obtain an estimated cooling efficiency of about 1.3 per cent and an estimated cooling power of 180 microwatts. At 100 kelvin, 532-nm pumping leads to a net cooling of about 15 kelvin with a cooling efficiency of about 2.0 per cent.

Two percent efficiency is not going to make this device a replacement for mechanical refrigeration anytime soon. And hundreds of microwatts of cooling does not a window air conditioner make.

And then there is another point made in the press release:

> “Not only that, but it would also remove the need for compressors and coolants in air-conditioning and refrigerators used in our homes and automobiles, saving space, energy and green house gases which are **harmful to our ozone layer**.

The actual paper gives the lie to the first part of the statement. But what about the ozone layer harm caused by refrigerant gasses leaking into the atmosphere? Let me say first that chlorofluorocarbons (CFCs) were going off patent at the time of the scare and hydrochlorofluorocarbons (HCFCs) the chemicals designated to replace CFCs were still on patent at that time. Nice coincidence isn't it?

Well that got me to looking for alternate views [3]on ozone-layer depletion.

> Professor F. Sherwood Rowland, inventor of the ozone-depletion theory, and his school maintain that chlorine from the oceans and volcanoes does not reach the stratosphere.(5) In their explanations of this belief, however, Rowland and others are being less than honest.
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> First, we should look at the numbers. According to Rowland's theory, some 7,500 tons of chlorine is released every year in the stratosphere as a result of the breakdown of CFCs by intense ultraviolet radiation. Rowland and his followers, however, do not mention that their theoretical reaction has never been observed to occur in the stratosphere, nor has it ever been carried out in a laboratory. In other words, the actual contribution of chlorine to the stratosphere from CFCs may be zero.
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> Nevertheless, for the sake of argument, let's assume that CFCs do contribute 7,500 tons of chlorine to the stratosphere annually. How does this compare with natural sources? Ocean biota inject 5 million tons of chlorine into the atmosphere annually; biomass burning, 8.4 million tons; volcanoes, 36 million tons; and evaporation of seawater, 600 million tons – for a total of almost 650 million tons per year. The amount of chlorine injected into the atmosphere from natural sources is hundreds of thousands of times greater than the amount of chlorine allegedly released by the breakdown of CFCs in the stratosphere!
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> However, Rowland et al. claim that almost none of this natural chlorine reaches the stratosphere be-cause it is "rained out." This is a preposterous claim. As readers can attest, it doesn't rain all the time in all places, and, as a matter of fact, there are many places on Earth where it barely rains at all. How is the chlorine washed out of the atmosphere in these regions?

There is much more at the link if you are interested, including a bit on volcanoes. I don't know if the above is correct. I do know that the science is not settled (in fact, science is never settled), and we did replace more efficient refrigerants with slightly less efficient refrigerants by political diktat. I wonder if the difference in efficiency was taken into account when making the decision? Or was the political action driven strictly by fear?

Getting back to laser refrigeration: Why do people think that they have to attach every new useful discovery (and in some circumstances, this cooler will be very handy) to the latest environmental scare? And these scares have been going on for quite some time. Remember the fear that our cities would be drowned in horse manure [4] if we kept using horses for transportation? That one goes back to 1894.

It is more than possible that man-made ozone layer depletion is horse manure of a different sort.

M. Simon's e-mail can be found on the sidebar at Space-Time Productions [5].

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