kept around 32.5°C. Parasitized eggs of *Pyrilla perpusilla* Walker, when shifted from 25 to 27.5 ± 1.5°C, resulted in faster development and earlier emergence of *T. pyrillae*. For the development and emergence of the parasitoid, the upper limit of the temperature was found to be around 30 ± 1.5°C.

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NEWS

LIGHT SEPARATION FOR ISOTOPES

Lasers have become an invaluable tool in academic and industrial R&D—and today this market accounts for almost a quarter of the $400 m total commercial sales. A traditional application of lasers in chemistry has been in spectroscopy. A more recent development is their use in isotope seperation.

Isotopes are difficult to distinguish spectroscopically because their characteristic frequencies are close together. Early work in the infrared region showed that large vibrational shifts in absorption features of particular isotopes could be matched to the output of the laser. Monochromaticity or pure colour ensures that the effects produced are specific; there are no unwanted interactions with other isotopes. Despite further developments, a mismatch remained between efficient laser output in the infrared and molecular absorption, limiting the versatility of this approach.

In contrast, isotope shifts in electronic spectra of atomic species are smaller and often obscured by Doppler broadening.

However, as Dr Mark Humphries of Coherent (UK), Cambridge, told *Chemistry in Britain*, by generating atoms in a molecular beam, these problems were overcome and spectrally distinct absorption features could be resolved for each isotope. One method of generating the atoms is by laser vaporisation.

Once the sample has been vapourised and entrained in a molecular beam, isotopic seperation is achieved using photoionisation in the visible region. For example, an ion laser or a copper vapour laser in the visible region is used to excite a dye (e.g. rhodamine 6G) in a tunable dye laser. The narrow bandwidth dye laser, using either pulsed or continuous waves (CW), produces photons of specific energy, exciting a particular isotope to an intermediate state, which then absorbs further photons of the same or higher energy leading to ionisation. Once selective ionisation is achieved, separation of isotopes follows. The whole process is called atomic vapour laser isotope separation (AVLIS).

A CW ring dye laser, with absolute frequency calibration and narrow bandwidth, provides detailed knowledge of the atomic spectroscopy of the particular element to optimise the ionisation efficiency. The continuous tunability of such lasers means that a vast number of intermediate states for most elements are accesssible, making isotope separation for many elements possible. This has a wide range of uses in the nuclear industry.

The US Department of Energy has recently backed the AVLIS process for uranium isotope seperation as a future method for generating reactor fuel.

As Dr Humphries says 'this truly is an example where the laser has virtually revolutionised a whole industry and will make a variety of isotopically enriched elements available for a vast number of applications'. (*Chemistry in Britain*, May 1987, p. 411; Published by the Royal Society of Chemistry, (CET) Burlington House, London WIV OBN, England.)