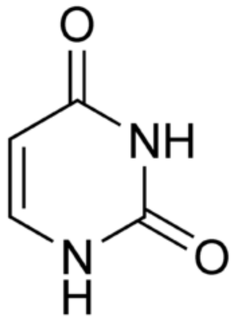
Uracil transformation in the thermal neutron field

a special case of nucleoside research

juhnowski@gmail.com

Currently on the market by Alfa Aesar
86 nucleoside compounds are presented.
Uracil is part of RNA - therefore it is interesting for biologists

Bond type	D_0	
	kkal	eV
C_2^+	126±15	5,5
C_2	144±3	6,3
C_2^-	187±10	8,1
CH^+	93,8±0,5	4,1
CH^-	110±7	4,8
CO^+	192,9±0,1	8,4
CN^-	239±1,5	10,4
N_2^-	201,4±0,2	8,8
NH^-	85±5	3,7

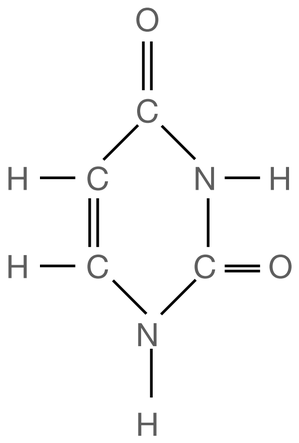


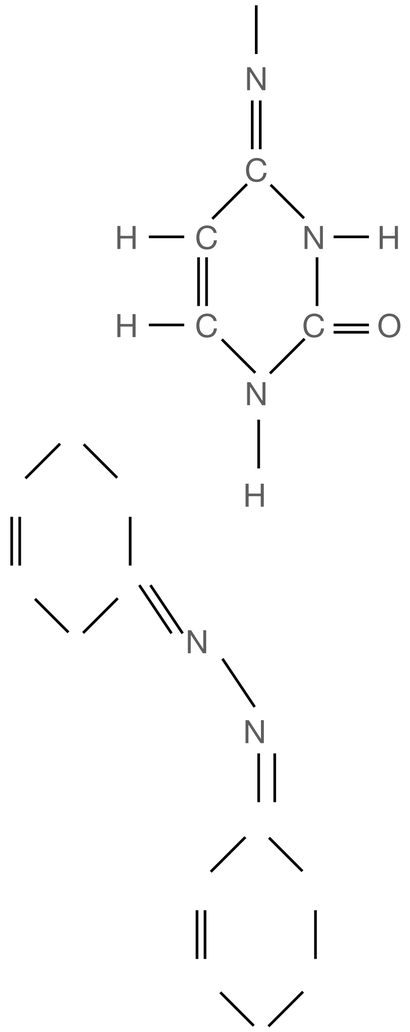
Alfa Aesar
by Thermo Fisher Scientific

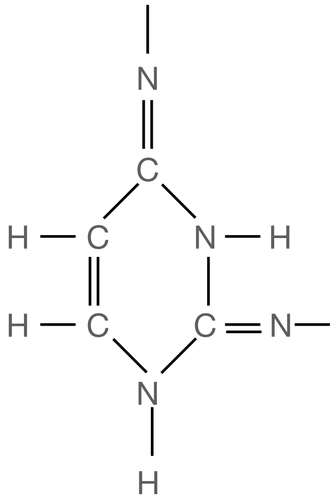
Boundary energy of neutrons - no more than 3.7 eV in order not to break bonds by neutrons

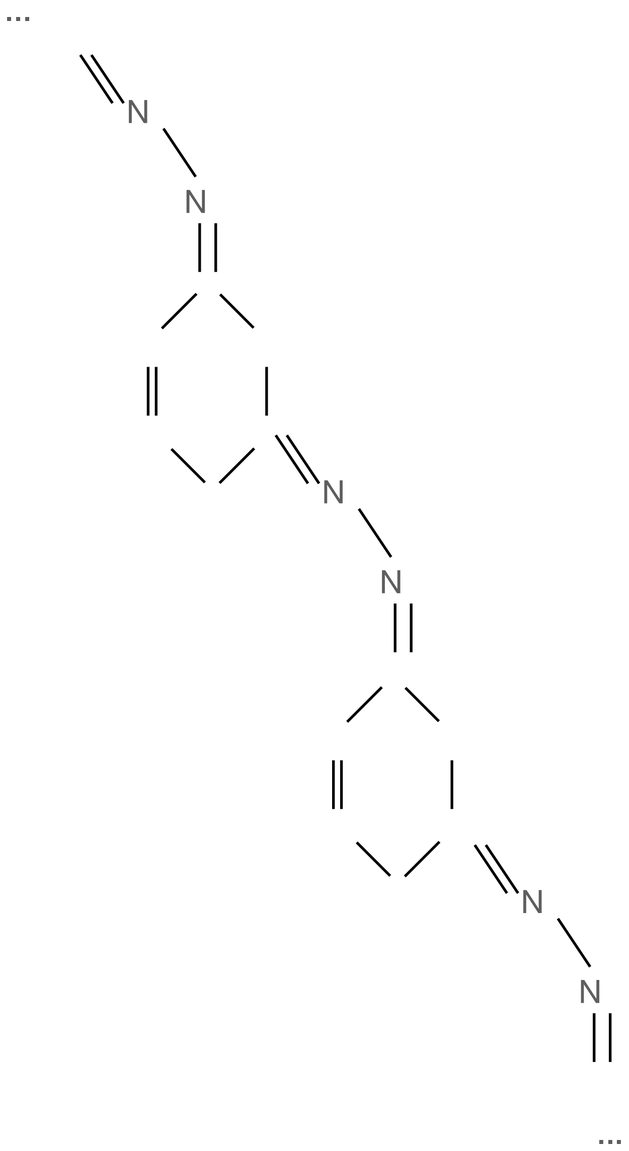
On thermal neutrons, various nuclear reactions of nucleoside elements are possible - C, N, O

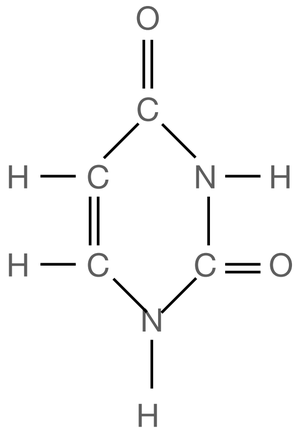
O -> N



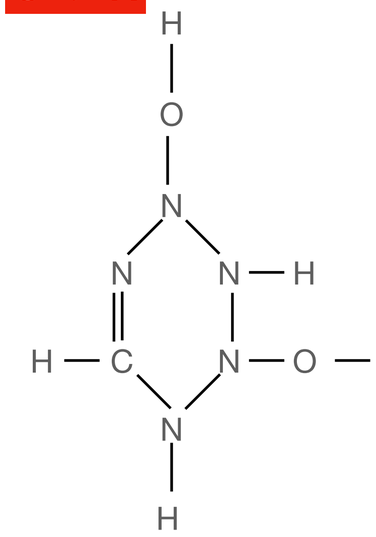


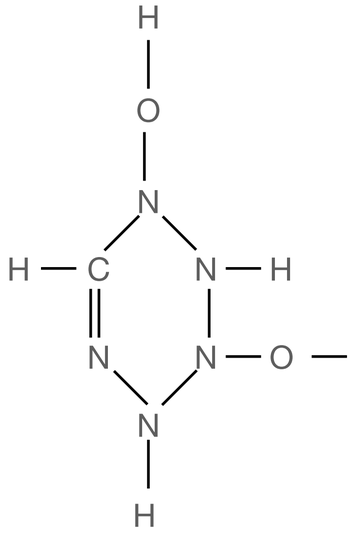


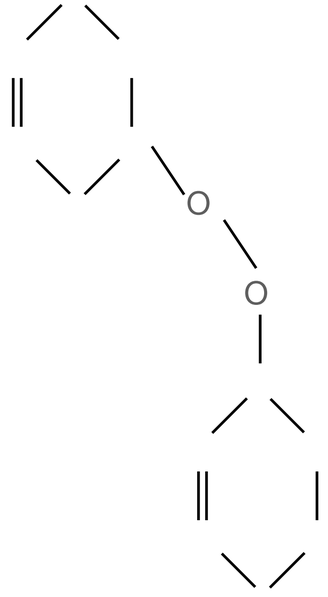


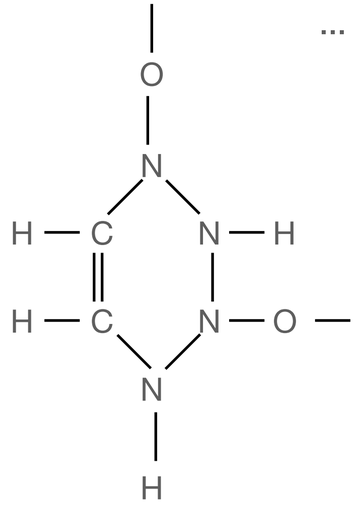


C -> N

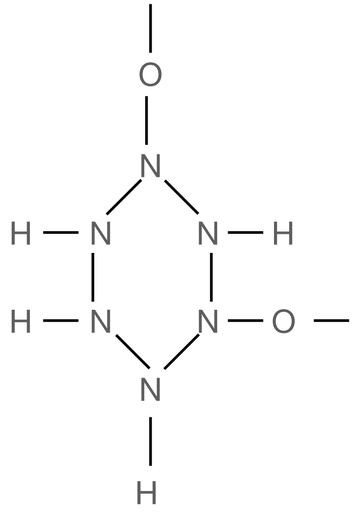


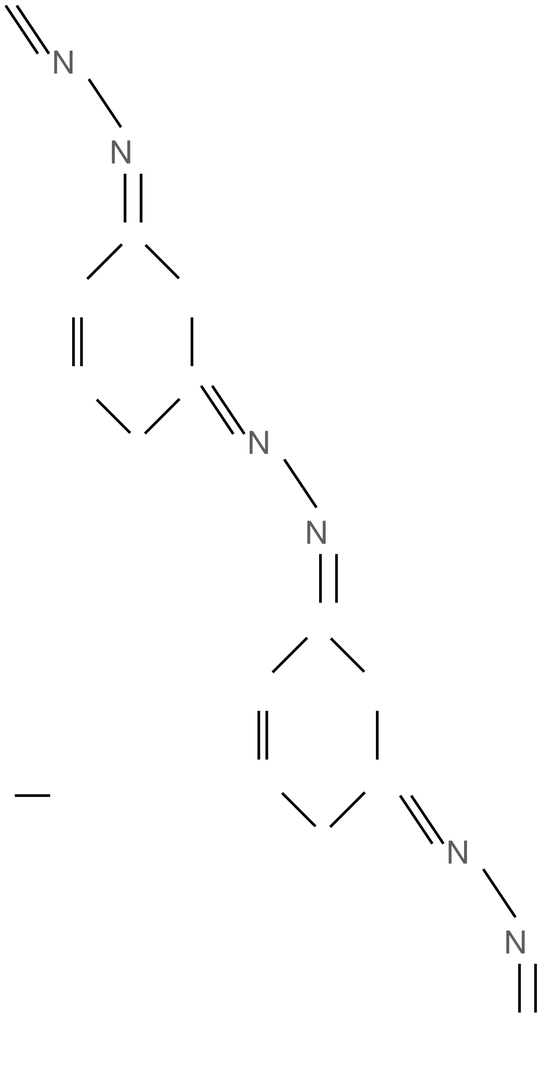




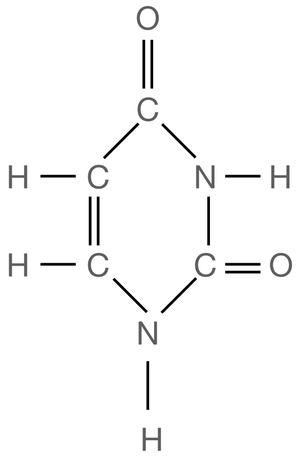


...

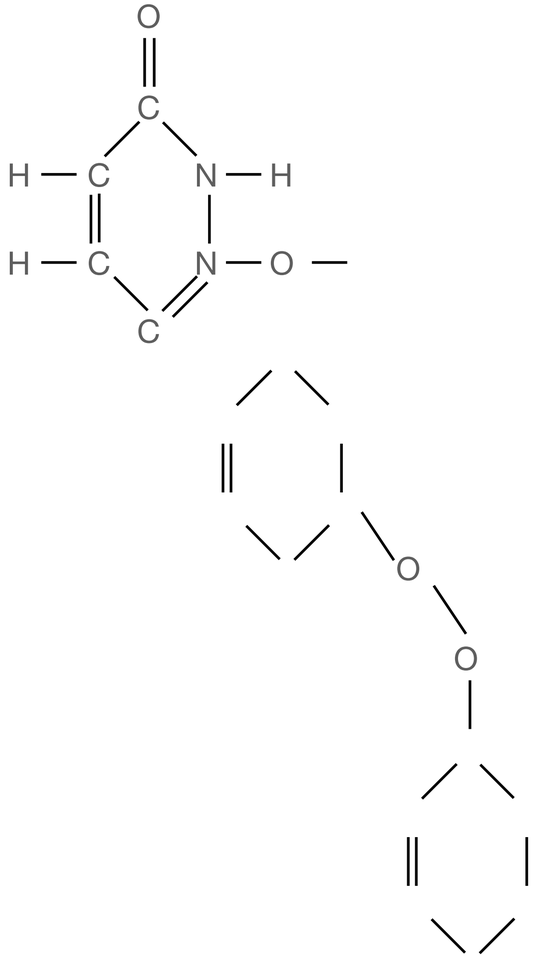


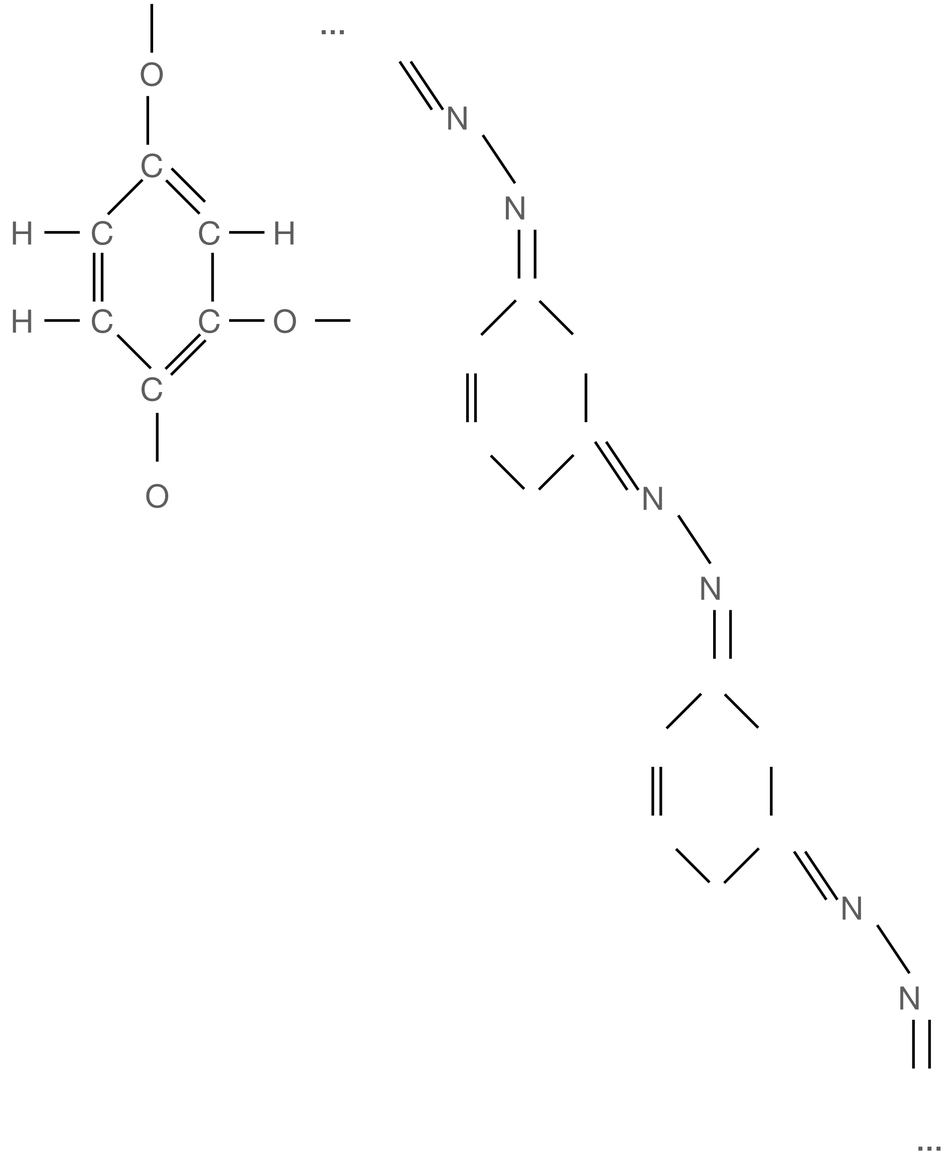


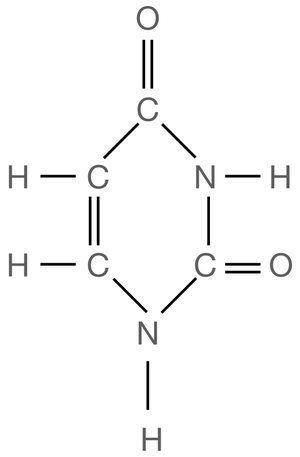
...



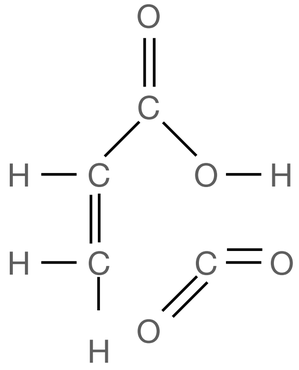
N -> C







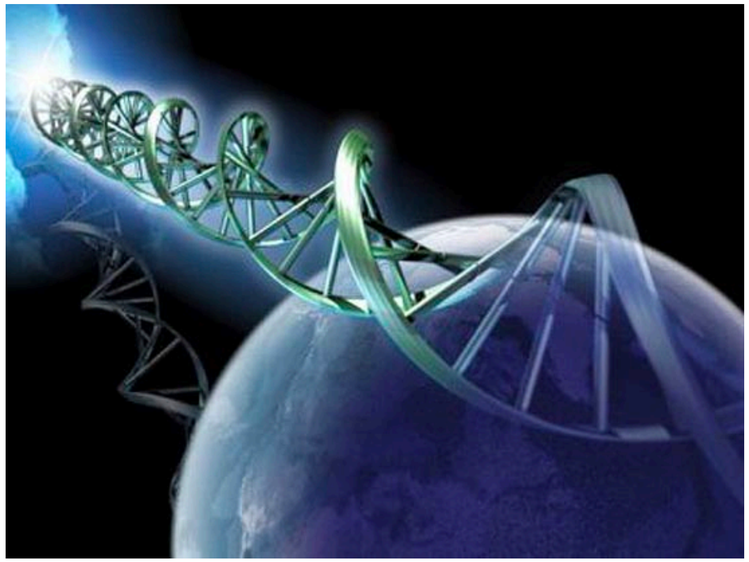
N -> O



Practical use

Possible explanation for the origin of life

If we reverse the decay process of uracil at N-> O, then we get its synthesis at O-> N



Possible nucleic acid editing tool

We are embedded in a chain, with an unstable isotope, the isotope decays, the chemical properties change - the chain breaks
Another option is to change the energy of neutrons, transform, and at the right time, "cut off" with oxygen (N-> O)

Research volume

Stage I - for pure uracil and uracil

- **Measure the cross sections of the uracils**
- **Select high-quality chemical reactions for each transformation**
- **Investigate the probabilities of reactions and their kinetics**

Stage II - for uracil as an element of RNA

- **Determine promising structures for RNA editing by method:**
  - **isotope decay**
  - **resonance irradiation**

Test the hypothesis of uracil synthesis in the thermal neutron flux

- **if successful, test a similar process on other nucleosides**
- **if unsuccessful, experimentally find the conditions for the successful course of the reaction**

Materials

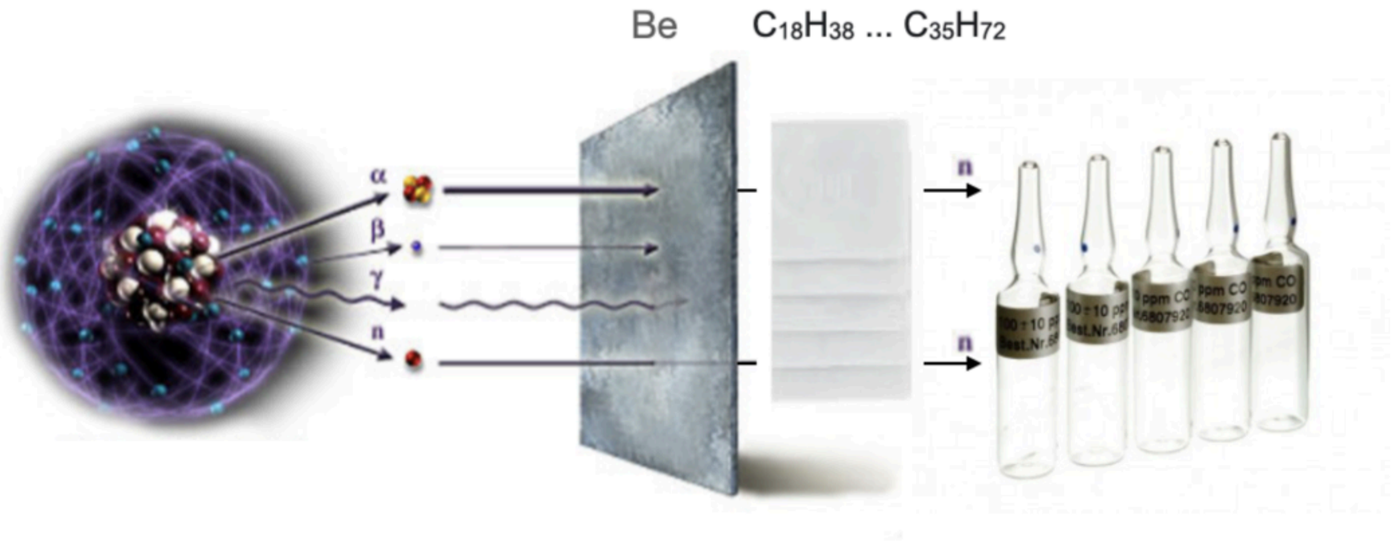
Uracil

A15570 Uracil

Affordable uracils for quality reactions

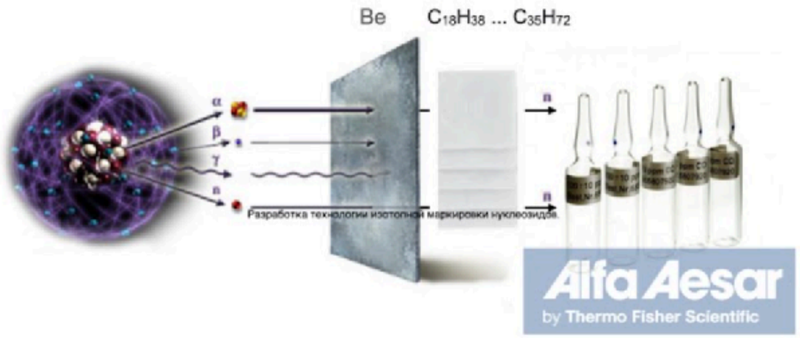
H50287 1,3-Dimethyluracil-5-carboxaldehyde
L19664 1,3-Dimethyluracil
H61919 4-Thiouracil
L01996 5,6-Dihydro-5-methyluracil
L02292 5,6-Dihydro-6-methyluracil
L01918 5,6-Dihydrouracil
44378 5-Acetyluracil
L04452 5-Aminouracil
A14799 5-Bromouracil
44639 5-(Chloromethyl)uracil
L08490 5-Cyanouracil
L10861 5-Ethyluracil
L01682 5-(Hydroxymethyl)uracil
B25173 5-Iodo-1,3-dimethyluracil
A18994 5-Iodouracil
H55913 5-Nitro-6-methyluracil
A12448 5-Nitrouracil
L16196 5-(Trifluoromethyl)uracil
44379 5-Vinyluracil
B25448 6-Amino-1-methyluracil
L03332 6-Aminouracil
B21985 6-(Chloromethyl)uracil
L01875 6-Chlorouracil
H51694 6-(Diethoxymethyl)uracil
B24191 6-Methyluracil
44467 6-(Trifluoromethyl)uracil
H26507 Ethyl uracil-5-carboxylate
L16407 O,O'-Bis(trimethylsilyl)-5-fluorouracil
H27219 Uracil-5-boronic acid
H51098 Uracil-5-carboxaldehyde
H50469 Uracil-6-carboxaldehyde monohydrate

Laboratory unit model



https://sites.google.com/view/bio-isotope-cloud/main-page

The essence of the idea



Mark nucleoside atoms "in place" with slow neutrons