Chart Of The Nuclides 2006

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Abstract The Chart Of Nuclides 2006 was developed taking into account the data obtained in 1998-2006. Unlike widespread nuclide charts the present Chart of Nuclides contains evaluated values of the main characteristics such as mass excess, nuclide percent abundance, thermal neutron capture cross sections for stable and natural long-lived nuclides; half-life, decay energy and spin, parity of ground/isomeric state for radioactive nuclides. These values are supplied with the standard deviations and taken from the evaluated data of China Nuclear Data Center and Nuclide Guide-3, Nuclear Wallet Cards, evaluated thermal neutron capture cross sections and evaluated atomic data. The presented data are applicable in medicine, agriculture, environmental protection etc.

KeyWords chart of nuclide, nuclides, isotopes, mass excess, spin, decay mode, radiation energy, half-life, decay energy, cross sections, abundance, evaluated data.

1. Introduction

Chart of the nuclides is very useful to the nuclear scientists. Through chart of the nuclides, it's very easy and rapid to get the fundamental nuclear data such as atomic mass, abundance, spin and parity; the decay mode, branching ratio, half-life and Q-value of radioactive nuclide, energy and intensity of strong γ-ray, etc. Thus the main nuclear data center in the world has setup their own chart of the nuclides.

The cooperation in the field of chart of the nuclides between China and Russia has been starting since 1995. Up to now they have compiled and recommended lots of nuclear data. On the basis of these researches, we prepared the Chart Of Nuclides 2006.

2. Brief instruction of the chart of nuclides

This Chart Of Nuclides 2006 was developed as the updated International Chart of Nuclides-1998. It contains brief information on characteristics of all isotopes of 118 chemical elements known by 2006. This Chart of Nuclides is a peculiar "wall guide" on nuclides and intended for being used by wide circle of experts of different level who would like to have primary true information on stable and radioactive nuclides.

Unlike widespread nuclide charts that also bring brief information on nuclides, the present Chart of Nuclides contains evaluated values of the main characteristics such as mass excess, nuclide percent abundance, thermal neutron capture cross sections for stable and natural long-lived nuclides; mass excess, half-life, decay energy and spin,parity of ground/isomeric state for radioactive nuclides. These values are supplied with the standard deviations. They have been

obtained on the basis of the evaluated data of China Nuclear Data Center[1] and Nuclide Guide-3[2], Nuclear Wallet Cards[3], evaluated thermal neutron capture cross sections[4,5] and evaluated atomic data[6].

The uncertainties of the recommended values are parenthetical and provided with the number of units of the last significant digit of the value: for instance, 99.9(28) means 99.9±2.8.

Half-life evaluated values (with uncertainties) are presented for radioactive nuclides. Nuclide percentage in natural mixture of isotopes for a given chemical element is mentioned for stable nuclides instead of half-life. Both values, i.e. half-life and abundance of isotopes in natural mixture, are presented for natural long-lived radioactive nuclides.

Basic decay types with percentage of branching, and evaluated values (with uncertainties) of decay energies (Q-values, in keV) obtained on the basis of data[2,3,6] are presented.

Thermal neutron capture cross sections are presented for the stable and natural long lived nuclides in accordance with reference[4,5].

Nuclides in the chart are arranged as Z-N diagram, where Z is the number of protons in a nucleus, N is the number of neutrons. Z grows on along the vertical from bottom to top; N grows on along the horizontal from left to right. The following information for each radioactive nuclide is contained in the information boxes arranged along the lines:

1. Nuclide symbol with mass number;
2. Mass excess;
3. Spin of ground state of nucleus;
4. Half-life;
5. Decay modes;
6. Decay energy;
7. Thermal neutron capture cross section.

All the values in the first five lines are arranged in such a way that information on the same characteristic for different nuclides is put along the same horizontal line. As for the stable nuclides, the abundance of nuclide in natural mixture of isotopes (percentage) is indicated in the forth line and the thermal neutron activation cross section is indicated in the last line
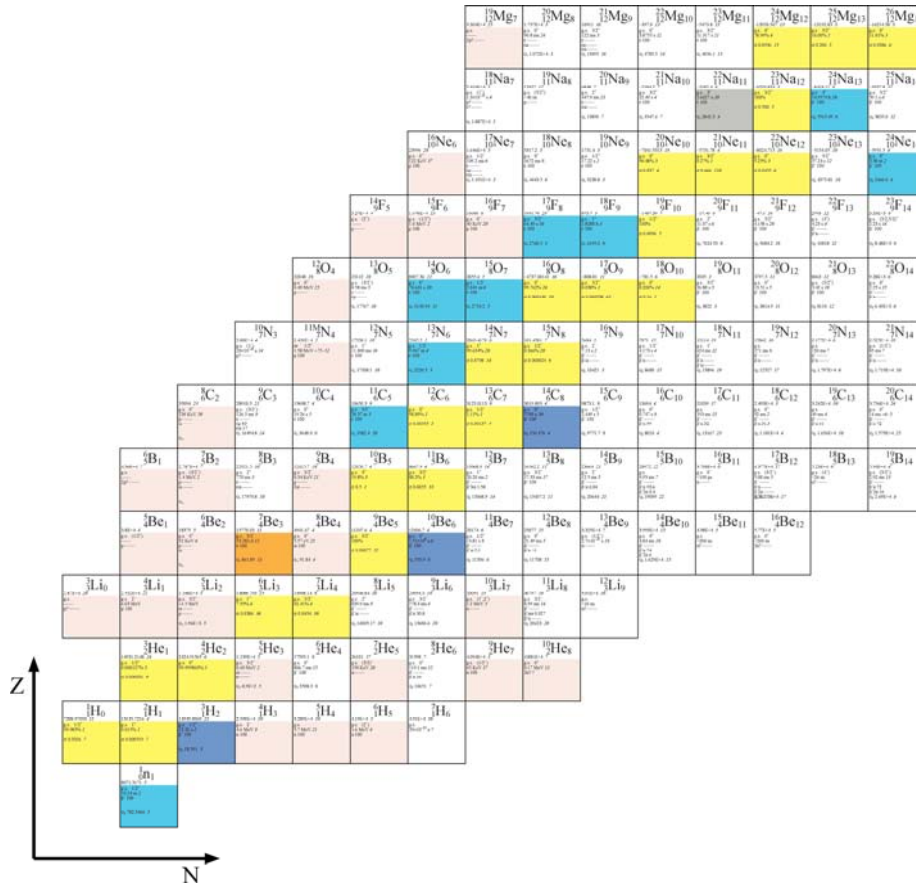
Fig.1 is an example of the partial chart of nuclides.

Fig.1   Partial of the chart of nuclides.

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