Physics and Engineering for BNCT

October 9th, 2017 Tooru Kobayashi

1 History of BNCT
1.1 Trials in the United States
1.2 Development in Japan
1.3 Global reevaluation
1.4 Ecdysis to familiar radiation therapy
1.5 Historic background that is made in a turning point
1.6 International Congress on Neutron Capture Therapy

2 Principle of BNCT

3 Characteristics of BNCT
3.1 Absorbed dose in the BNCT treatment
3.2 Relations of boron compound and the BNCT treatment
3.2.1 The internal time change of the boron compound
3.2.2 The number of times of the BNCT treatment and irradiation time per once

4 Favorable BNCT irradiation condition
4.1 Thermal neutron, epithermal neutron, fast neutron, gamma-rays

5 BNCT irradiation system
5.1 Nuclear reactor BNCT irradiation system
5.1.1 Design guidelines
5.1.2 Fundamental researches of the BNCT irradiation system
5.1.3 Nuclear reactor BNCT irradiation system investigated for convenience
5.2 Accelerator BNCT irradiation system
5.2.1 Design guidelines
5.2.2 Slowdown usage and direct usage
5.2.3 Treatment planning program
5.2.4 Accelerator for BNCT

6 Research and development of the accelerator BNCT irradiation system
6.1 Process of development
6.2 Present conditions of the accelerator BNCT irradiation system development
6.2.1 Kyoto University nuclear reactor-Sumitomo heavy industries project
6.2.2 Tsukuba University - Mitsubishi Heavy Industries project
6.2.3 National cancer research center - CICS project
6.2.4 Osaka University - Sumitomo Corporation project
6.2.5 Nagoya University project
6.2.6 Tokyo Institute of Technology project
6.3 Subject of the system development
6.4 Final goal of the development

7 Research and development of the neutron generation target
7.1 Neutron generation reaction and target material
7.2 Liquid lithium target development
7.2.1 Process
7.2.2 Present conditions and future subject
7.2.3 Characteristic of the liquid Li target and the design of the practical machine

8 Next-generation accelerator BNCT irradiation system
8.1 Direct usage of the threshold near reaction neutron
8.2 Online dosimetry evaluation system

9 Summary
9.1 Limit of BNCT
9.2 BNCT stands in a turning point
9.3 The prospects of BNCT