

# INSTRUMENTATION FOR ENERGY DOMAIN SYNCHROTRON-RADIATION-BASED MÖSSBAUER ABSORPTION SPECTROSCOPY USING VARIOUS NUCLIDES

*R. Masuda<sup>1</sup>, Y. Kobayashi<sup>2</sup>, S. Kitao<sup>2</sup>, M. Saito<sup>2</sup>, M. Kurokuzu<sup>2</sup>, T. Mitsui<sup>3</sup>, Y. Yoda<sup>4</sup>, M. Seto<sup>2</sup>.*

*1 - Faculty of Science and Technology, Hirosaki University*

*2 - Institute for Integrated Radiation and Nuclear Science, Kyoto University*

*3 - National Institute for Quantum and Radiological Science and Technology*

*4 - Japan Synchrotron Radiation Research Institute*

*masudar@hirosaki-u.ac.jp*

Synchrotron radiation (SR) is a highly brilliant X-ray source with energies below typically 100 keV. In this energy region, there are many nuclides available for Mössbauer spectroscopy as its probe. SR-based Mössbauer absorption spectroscopy is a method for Mössbauer spectroscopy using these nuclides and we can obtain the absorption-type energy-domain Mössbauer spectra by this method.<sup>1,2)</sup> Recent improvement on the detection efficiency by means of the detection of internal conversion electrons<sup>3)</sup> extends its applicability; Mössbauer spectroscopy of <sup>40</sup>K, <sup>61</sup>Ni, <sup>73</sup>Ge, <sup>99</sup>Ru, <sup>119</sup>Sn, <sup>125</sup>Te, <sup>127</sup>I, <sup>149</sup>Sm, <sup>151</sup>Eu, <sup>158</sup>Gd, <sup>174</sup>Yb and <sup>189</sup>Os was performed until now and further nuclides are promising.

The measurement system for the SR-based Mössbauer absorption spectroscopy mainly includes the monochromator(s), transmitter, analyzer, and detector, as shown in Fig. 1. We summarize the current system and present its details, including the combination of the monochromators in addition to the standard monochromator, the chemical specimen of the energy reference for each nuclide, and detector for the nuclear resonance.

## References

- 1) S. L. Ruby, J Phys (Paris), Colloq 35, C6-209 (1974).
- 2) M. Seto, R. Masuda R, S. Higashitaniguchi, S. Kitao, Y. Kobayashi, C. Inaba, T. Mitsui, Y. Yoda, Phys Rev Lett 102, 217602 (2009).
- 3) R. Masuda, Y. Kobayashi, S. Kitao, M. Kurokuzu, M. Saito, Y. Yoda, T. Mitsui, F. Iga, M. Seto: Appl. Phys. Lett. 104, 082411 (2014).

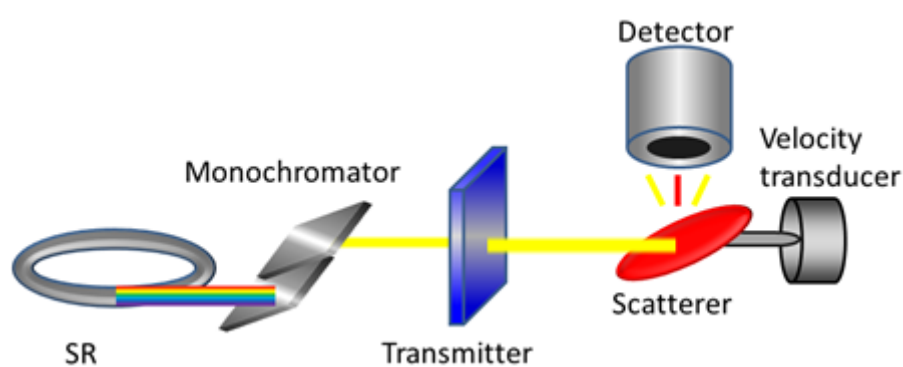


Fig. 1 A schematic drawing of the measurement system for the SR-based Mössbauer absorption spectroscopy. One of the transmitter and the scatterer is the sample under study and the other is the energy reference for the isomer shift.