AbstractID: 11123 Title: Relative Contributions of Rayleigh Scattering for PMMA in the Mammography Energy Range

Purpose: The method of obtaining the primary x-ray spectrum by the Compton scattering correction has been established for relatively high x-ray tube voltages. However, the influence of Rayleigh scattering can not be neglected in the mammography energy range. Besides, accurate data of Rayleigh and Compton cross sections for the scatterer material are required for obtaining the primary x-ray spectrum by correcting the scattered x-ray spectrum in mammography. The purpose of this study is to investigate theoretically and experimentally the relative contributions of Rayleigh scattering for PMMA (polymethyl methacrylate) in the mammography energy range. **Method and Materials:** Fluorescent x-rays in the energy range of 10 to 25 keV were generated by exciting four metal targets including molybdenum by synchrotron radiation. The fluorescent x-rays were incident on a sphere of PMMA, and the scattered x-rays were measured with a CdTe detector at scattering angles of 90, 120, 150, 165 degrees. The scattered fluorescent x-ray spectrum was separated into the Rayleigh and Compton scattering peaks by using a curve fitting technique with two Gaussian functions. We compared the measured cross section data to those obtained from theoretical values. We also calculated the scattered fluorescent x-ray spectra using the Monte Carlo simulation and compared them to the measured spectra. **Results:** The measured ratio of Rayleigh to total scattering cross section was about 30% at 10 keV. The maximum discrepancy of the measured and theoretically calculated values of the ratio was about 30% for the scattering angles of 90 to 165 degrees. However, at the angle of 120 degrees where the overall error might be minimum, the theoretical and experimental values agreed within 2%. **Conclusion:** Rayleigh and Compton scattering cross sections should be measured more precisely in order to improve the calculation of the primary mammography x-ray spectrum from the scattered x-ray spectrum.