X-ray multilayer coatings for use at energies above 100 keV

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We describe the development of new depth-graded X-ray multilayer structures that will enable the construction of grazing incidence telescopes which operate at energies above 100 keV. With a high-resolution, high-energy focusing mission based on such technology a variety of new observations will become possible, including: measuring the time-history of the emission from ^{56}Ni (158 keV) in Type 1a SNe; investigating the sites of particle acceleration in young SNR; measuring the nuclear continuum and cutoff in Seyfert I galaxies; and detection of Compton backscatter radiation (170 keV) in Galactic black hole candidates. We have recently investigated several new candidate X-ray multilayer structures – including Ni/Si, NiV/Si, NiCr/Si and Cu/Si – that all promise good performance above 100 keV. We will present experimental results directed at understanding the growth, structure and thermal stability of these systems, and discuss their potential performance at high energy.