Hard X-ray multilayers with increased radiation resistance

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Because of its low interfacial roughness W/Si-based multilayers are often used as reflective coatings for hard X-ray mirrors. Adding carbon in W and Si layers makes the interfaces smoother and high reflectivity can be achieved even with ultra-short period WC/SiC multilayers. However, there is a lack of information on their thermal and radiation stability. We investigated the thermal stability of WC/SiC over a wide temperature range for different multilayer periods and compared it with W/Si and W/SiC multilayers. Our conclusions, which are based on measured changes in material microstructure, surface and interface roughness, multilayer period and stress show that WC/SiC system has a very high thermal stability. This has been demonstrated to be a prerequisite for high radiation resistance and makes this material pair an attractive candidate for applications in extreme condition environments.