Photoemission study of valence states in Eu chalcogenides

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We studied electronic structure of magnetic semiconductors EuO, EuS and EuTe. The photoemission spectra show localized Eu 4f states and broad anion p bands. As the size of anion increases from oxygen to tellurium, anion p band width increases and eventually overlaps Eu 4f states. Hence in EuO and EuS, Eu 4f states are the highest occupied states lying above anion p band, while Te 5p band spreads widely over Eu 4f states to become valence band maximum in EuTe. It was also observed that Eu 4f states have width of 0.7eV and dispersion of 0.2eV in EuS by angle resolved photoemission spectroscopy. The width of the 4f spectra mainly originates from atomic multiplets, but the much larger dispersion than that of Eu metal is due to p-f mixing.