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## 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.