Anisotropy of shallow edges and plasmons in Ti$_2$AlC

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The ternary carbides with P6$_3$/mmc symmetry and T$_x$MX$_{x-1}$ compositions exhibit highly anisotropic structure and properties (T is an early transition etal, M a metal or semi-metal and X the carbon or the nitrogen). For example, it has been demonstrated that the vanishing Seebeck coefficient of the Ti$_3$SiC$_2$ compound is due to the different behavior of the thermoelectric tensor in the basal plane and along the c axis. Indeed, two wave functions are involved in the components of the thermoelectric tensor one in the basal plane with electron-like behavior and one out of the basal plane with hole-like behavior. These results call for experimental investigations of the anisotropy of these compounds near the Fermi level. We will present angular resolved EELS measurements of the Al-L$_{23}$ and low-losses in Ti$_2$AlC compared with Full Multiple Scattering modellisations and ab initio densities of states. It has also been found two plasmon resonances, which intensity ratio is also orientation dependent.