The loss of the anisotropy in the electrical conductivity in MgB$_2$ under pressure

ULISES ESTEVEZ, PABLO DE LA MORA, Depto. de Fisica, Fac. de Ciencias, UNAM, Mexico — MgB$_2$ is a multiple band superconductor, with two $\sigma$-bands and two $\pi$-bands. The $\sigma$-bands that are highly anisotropic are the responsible of the superconductivity in this compound. It has been shown that with Sc, C and Al doping the $\sigma$-bands reduce their anisotropy, but for the case of Al and C doping the bands fill up and as consequence the number of $\sigma$-carriers reduce and disappear which leads to $T_c$ reduction. In this work it is shown that pressure reducing the MgB$_2$-cell parameters which leads to an increase of the interplane $\sigma$-orbitals overlap. This leads to an increase of the $\sigma$-bands electrical conductivity in the $c$-direction, in other words, a reduction of the anisotropy of the $\sigma$-bands, on the other hand there is no band filling therefore no reduction of $\sigma$-carriers. This reduction as function of pressure follows a similar trend as $T_c$, thus showing that the anisotropy in the $\sigma$-bands could be an important factor of the high $T_c$ in MgB$_2$.

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