

Reinaldo Arturo Zapata Peña presents

Novel Optical Effects in Functionalized Graphene: Formalism and Simulations

to earn the degree of Doctor of Science (Optics)



CENTRO DE INVESTIGACIONES
EN ÓPTICA, A.C.

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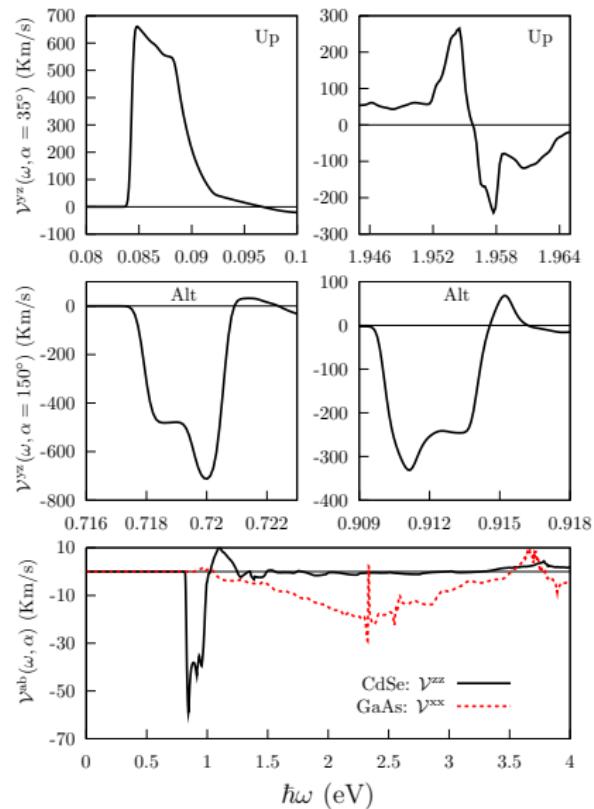
Optical current injection

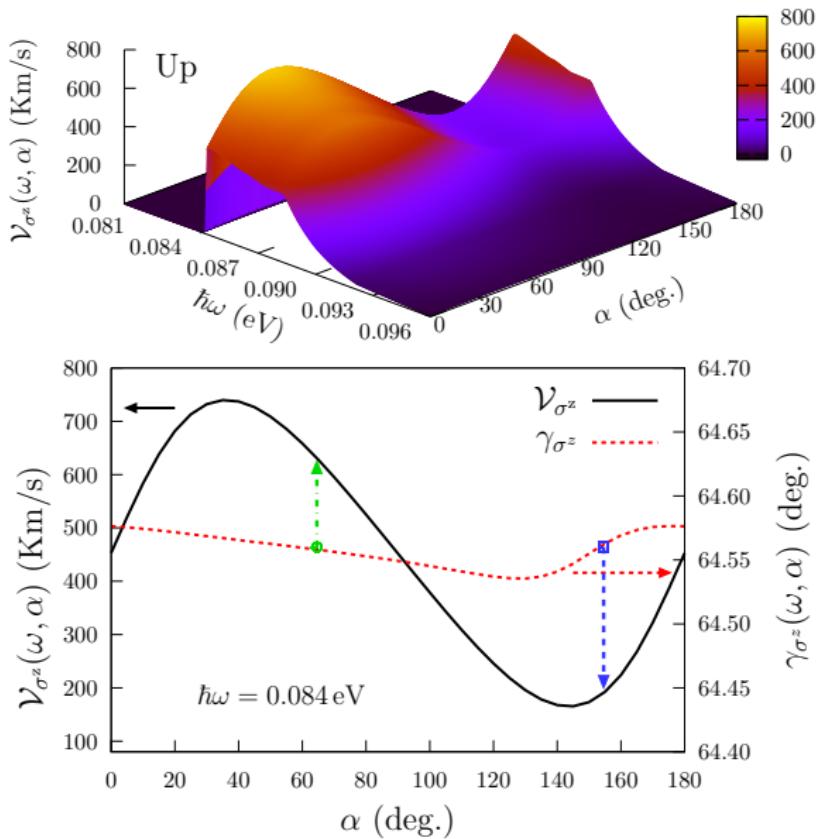
Degree of spin polarization

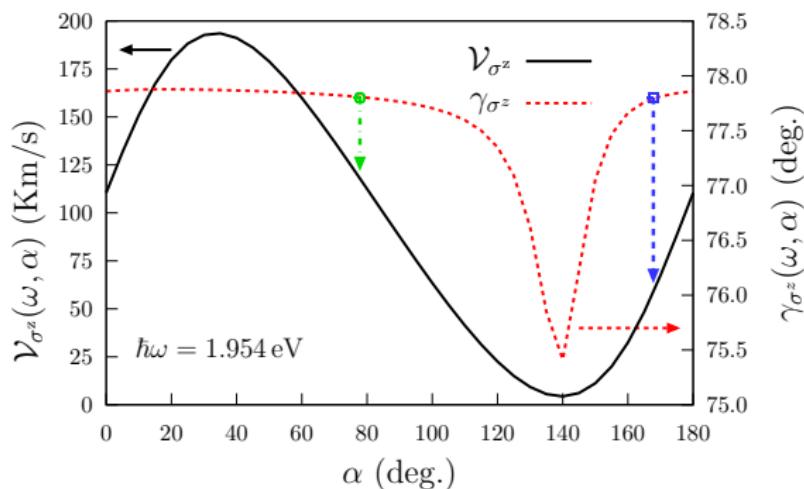
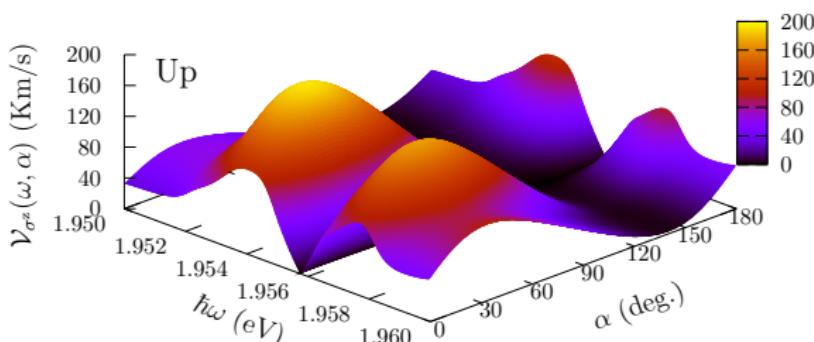
└ Results

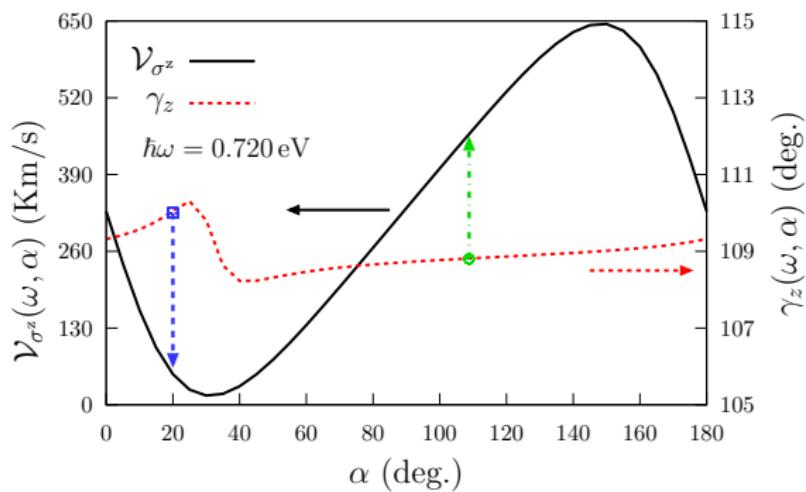
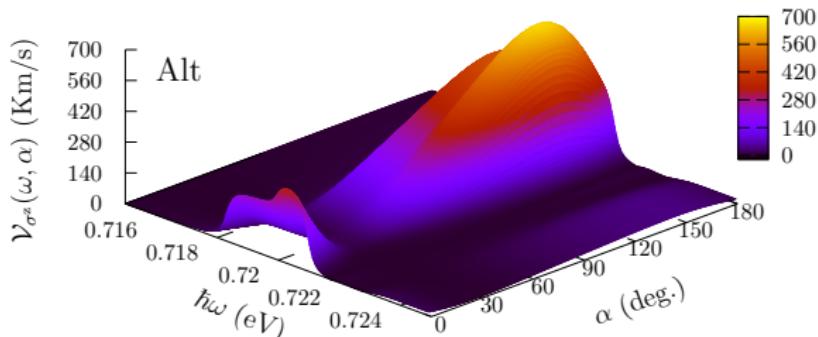
└ Spin velocity injection

- The function $\mathcal{V}^{ab}(\omega)$ allow us to quantify two aspects of PSC.
 - Fix the spin along $\hat{\mathbf{b}}$ and calculate the resulting electron velocity.
 - Fix the velocity of the electron along $\hat{\mathbf{a}}$ and study the direction along which the spin is polarized.



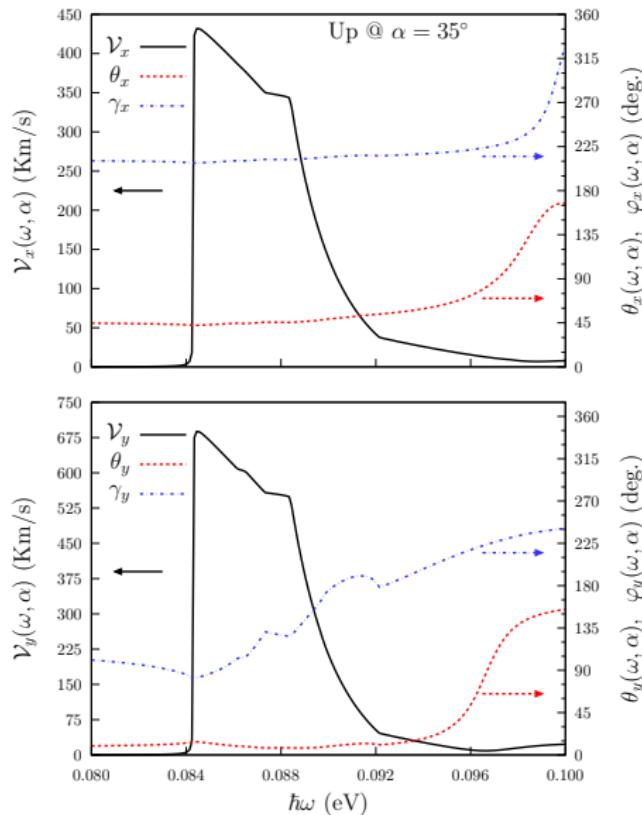






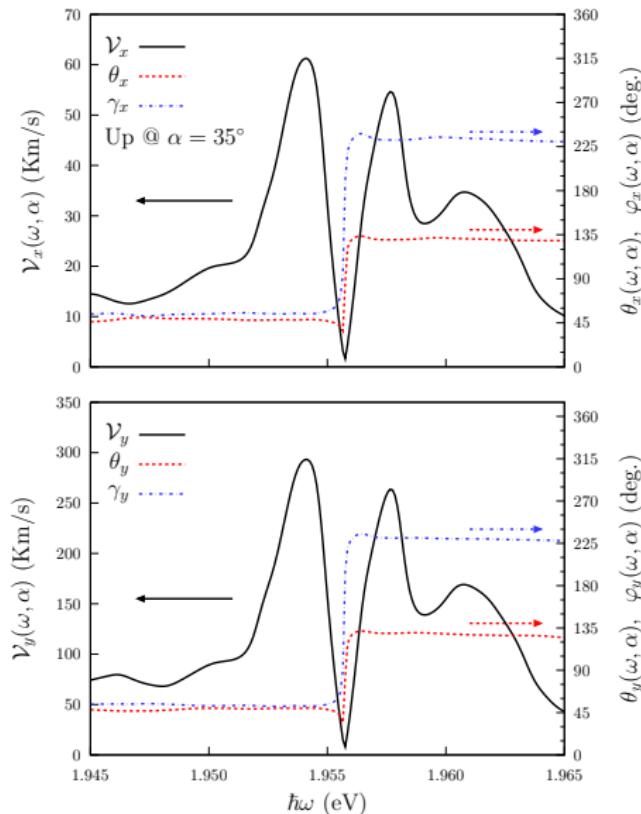
└ Results

└ Spin velocity injection



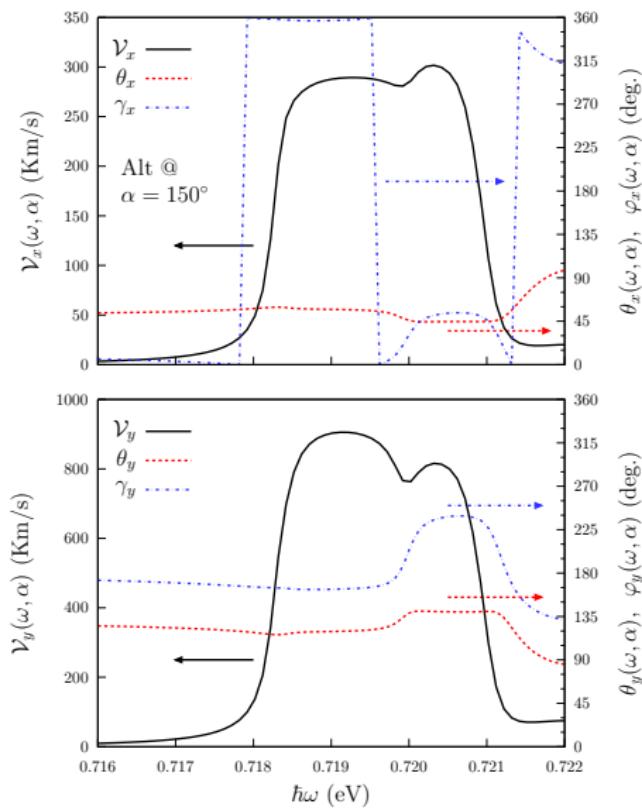
└ Results

└ Spin velocity injection



└ Results

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Conclusions

- We found that the *up* is more spin-polarizable than the *alt.*
- The *up* structure is can achieve a larger injection current being the response bigger than other structures but being overcome by the CdSe.
- Both structures are excellent candidates to generate second harmonic, particularly the *up* one.
- It is possible to generate pure-spin currents in our structures; also it is possible to control the spin orientation or the current direction making variations in the angle of the polarization of the incoming beam.