Spin control in graphene quantum dots and graphene nanoribbon superlattices

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In this poster session, we present the evolution of spin dynamics in graphene nanoribbon superlattices (GNSLs) with armchair and zigzag edges in the presence of a drift field. We determine the exact evolution operator and show that it exhibits spin echo phenomena due to rapid oscillations of the quantum states along the ribbon. The evolution of the spin polarization is accompanied by strong beating patterns. We also provide detailed analysis of the band structure of GNSLs with armchair and zigzag edges (Applied Physics Letters 103, 233112 (2013).

We also provide the results associated to the in-plane oscillations of the relaxed shape graphene due to externally applied tensile edge stress along both the armchair and zigzag directions. Here thermo-electromechanical effects are treated via pseudomorphic vector potentials to analyze the influence of these coupled effects on the bandstructures of bilayer graphene quantum dots (QDs). We show that the total elastic energy density is enhanced with temperature for the case of applied tensile edge stress along the zigzag direction. We report that the level crossing between ground and first excited states in the localized edge states can be achieved with the accessible values of temperature. In particular, the level crossing point extends to higher temperatures with decreasing values of externally applied tensile edge stress along the armchair direction. Such kind of level crossing is absent in the states formed at the center of the graphene sheet due to the presence of three fold symmetry (arXiv:1401.4608) (2014).