Theoretical studies of photoinduced topological phase transitions in organic salt α-(BEDT-TTF)$_2$I$_3$

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Optical controls of topologies in electronic matters have been intensively studied recently, triggered by a pioneering work by Oka and Aoki [1] that predicted the emergence of Chern insulator phase in photodriven graphene. However, materials and phenomena targeted by the research are still limited, and it is greatly demanded to widen the research targets for further development of this growing field.

We will discuss our recent theoretical studies that predicted novel phenomena and rich phases in photodriven organic salt α-(BEDT-TTF)$_2$I$_3$ and revealed their physical mechanisms using the Floquet theory. The topics are the following,

1. **Photoinduced topological phase transition to the Chern insulator** induced by circularly polarized light [2,3].

2. **Photoinduced pair annihilation of emergent magnetic charges** induced by linearly polarized light (2D version of monopole-antimonopole pair annhilation, Fig. 1) [4].

3. **Novel type of photoinduced topological phase transition** from Chern insulator to band insulator accompanied by collision and collapse of Dirac points induced by elliptically polarized light [5].

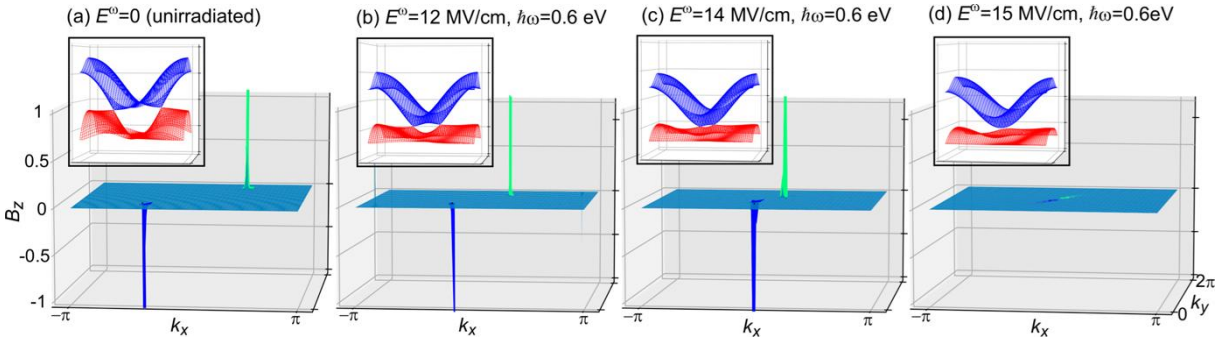

Fig. 1. Evolution of Berry curvatures and band structures in irradiated α-(BEDT-TTF)$_2$I$_3$ associated with the photoinduced pair annihilation of topological magnetic charges [4].

References

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