Floquet engineering of gapped 2D materials

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It is demonstrated theoretically that the interaction of gapped 2D materials (gapped graphene and transition metal dichalchogenide monolayers) with a strong high- crucially changes the band structure of the materials. As a consequence, the renormalized band structure of the materials drastically depends on the field polarization. Particularly, a linearly polarized dressing field always decreases band gaps, whereas a circularly polarized field breaks the equivalence of band valleys in different points of the Brillouin zone and can both increase and decrease corresponding band gaps. It is shown also that a dressing field can turn both the band gaps and the spin splitting of the bands into zero. As a result, the dressing field can serve as an effective tool to control spin and valley properties of the materials in various optoelectronic applications.

Acknowledgements

The work was partially supported by RISE Program (project CoExAN), FP7 ITN Program (project NOTEDEV), Russian Foundation for Basic Research (project 17-02-00053), Rannis project 163082-051, and Ministry of Education and Science of Russian Federation (projects 3.4573.2017/6.7, 3.2614.2017/4.6, 3.1365.2017/4.6, 3.8884.2017/8.9 and 14.Y26.31.0015)