TM is much larger than the absorption suppression for TE up to an angle of around 60°. As a result abs_{total} for unpolarized light is still enhanced considerably for a large angular range. For instance for unpolarized perpendicular light, gratings can still enhance the absorption with an average, relatively good enhancement factor of around 1.2.

3. Conclusion

In conclusion, we investigated the influence of combined gratings on the absorption in the active layer of organic solar cells. A broadband absorption enhancement over a large angular range observed. With an optimal period a factor 1.35 enhancement is reached for TM polarized perpendicular light. The enhancements are traced back to modes in the individual front or back grating cases, so the structures function semi-independently. Detailed Bloch dispersion calculations present the mixed character of localized and propagating plasmonic modes, and the bright and dark character. The dark modes provide a mechanism for absorption over a large angular range. Finally, we find that the TE component of the solar light will not decrease the observed enhancement strongly.

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