

Modeling transmission light in photonic band gap of one-dimensional photonic-plasmonic crystals with buffer layer

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Abstract

© Published under licence by IOP Publishing Ltd. The optical transmission wasn't researched completely for the hybrid plasmonic-photonic crystal with buffer dielectric layer between photonic crystal (PC) and layer of gold. In this article we consider the dependence of wavelength of the Tamm plasmon on refraction index of the buffer layer. Wavelength of the transmission peak in the photonic band gap increases at the increasing refractive index of buffer layer between metal and PC. Intensity of the transmission peak in the photonic band gap decreases at the increasing refractive index of buffer layer in metal-PC interface. So we can change distribution of energy inside hybrid photonic-plasmonic mode. This results have a promise application in developing lasers and sensors.

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References

- [1] Barnes W, Dereux A and Ebbesen T 2003 Nature 424 824-830
- [2] Homola J, Ye S and Gauglitz G 1999 Sens. Actuators B. 54 3-15
- [3] Kneipp K, Kneipp H, Itzkan I, Dasari R and Feld M 2002 J. Phys.: Condens. Matter. 14 597-624
- [4] Krasavin A, Zayats A and Zheludev N 2005 J. Opt. A, Pure Appl. Opt. 7 85-89
- [5] Zayats A and Smolyaninov I 2003 J. Opt. A, Pure Appl. Opt. 5 16-50
- [6] Symonds C, Lheureux G, Hugonin J P, Greffet J J, Laverdant J, Brucoli G, Lemaitre A, Senellart P and Bellessa J 2013 Nano Lett. 13 31793184
- [7] Zhang W L, Wang F, Rao Y J and Jiang Y 2014 Optic Express 22 14524-14529
- [8] Novotny L and Hecht B 2006 Principles of nano-optics (New York: Cambridge Univrsity Press) 539
- [9] Maier S 2007 Plasmonics: Fundamentals and Applications (Springer Science + Business Media LLC) 224
- [10] Kaliteevski M, Iorsh I, Brand S, Abram R A, Chamberlain J M, Kavokin A V and Shelykh I A 2007 Phys. Rev. B 76 165415
- [11] Joannopoulos J D, Johnson S G, Winn J N and Meade R D 2008 Photonic crystals: molding the flow of light (Princeton: Princeton University Press) 286
- [12] Gainutdinov R Kh, Khamadeev M A and Salakhov M Kh 2012 Phys. Rev. A 85 053836
- [13] Gainutdinov R Kh, Khamadeev M A and Salakhov M Kh 2013 J. Phys.: Conf. Ser. 478 012017
- [14] Akhmadeev A A, Gainutdinov R Kh, Hermann G, Khamadeev M A, Steryakov O V and Salakhov M Kh 2015 J. Phys.: Conf. Ser. 613 012005
- [15] Sasin M E, Seisyan R P, Kaliteevski M A, Brand S, Abram R A, Chamberlain J M, Iorsh I, Shelykh I A, Egorov A Yu, Vasilev A P, Mikhlin V S and Kavokin A V 2010 Superlattices and Microstructures 47 4449

- [16] Angelis F, Das G, Candeloro P, Patrini M, Galli M, Bek A, Lazzarino M, Maksymov I, Liberale C, Andreani L and Di Fabrizio E 2010 *Nature Nanotechnology* 5 67-72
- [17] Gazizov A R, Zohrabi M, Kharintsev S S and Salakhov M Kh 2016 *J. Phys.: Conf. Ser.* 714 012010
- [18] Yablonovitch E 1987 *Phys. Rev. Lett.* 58 2059-2062
- [19] Ding B, Pemble M, Korovin V, Peschel U and Romanov S 2010 *Phys. Rev.* 82 035119
- [20] Lopez-Garcia M, Galisteo-Lopez J F, Blanco A, Sanchez-Marcos J, Lopez C and Garcia-Martin A 2010 *Small* 6 1757-1761
- [21] Lopez-Garcia M, Galisteo-Lopez J F, Blanco A, Lopez C and Garcia-Martin A 2010 *Adv. Funct. Mater.* 20 4338-4343
- [22] Ding B, Bardosova M, Pemble M E, Korovin A V, Peschel U and Romanov S G 2011 *Adv. Funct. Mater.* 21 4182-4192
- [23] Romanov S G, Korovin A V, Regensburger A and Peschel U 2011 *Adv. Mater* 23 2515-2533
- [24] Galisteo-Lopez J F, Lopez-Garcia M, Lopez C and Garcia-Martin A 2011 *Appl. Phys. Lett.* 99 083302-1-3
- [25] Chen Y, Zhang D, Zhu L, Wang R, Wang P, Ming H, Badugu R and Lakowicz J R 2014 *Optica* 1 407-413
- [26] Liu T-I, Russel K J, Cui S and Hu E L 2014 *Optics Express* 22 8219-8225
- [27] Lin T, Lin J, Guo J and Kan H 2015 *Adv. Optical Mater.* 3 1470-1475
- [28] Frederich H, Wen F, Laverdant J, Coolen L, Schwob C and Maitre A 2011 *Optics Express* 19 24424-24433
- [29] Afinogenov B I, Bessonov V O, Nikulin A A and Fedyanin A A 2013 *Appl. Phys. Lett.* 103 061112