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利用課題名(日本語) :
Program Title (English) : Observation of Near-Field Enhancement in Topological SSH Model
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1. 概要(Summary)

Topological optics has been popular in these years, because there are lots of special properties in topological systems, for example, the robustness, which can support the light localized at or propagating along the edge of the designed structures in the case of disturbing. What's more, Near-field enhancement plays an important role in plasmonic systems, and this crucial property can affect many uses of applications, such as different kinds of sensors, high-speed chips process, photocatalysis and so on. However, there are little investigations about the topological plasma in SSH model, and in this study, we try to explain the inner link between the bulk energy and the topological plasma.

2. 実験(Experimental)

【利用した主な装置】

時間分解光電子顕微鏡システム(Elmitec); 超高精度電子ビーム描画装置 (EBL, ELS-F125-U, Elionix); ヘリコンスパッタリング装置 (MPS-4000C1/HC1, ULVAC); 高分解能電界放射型走査型電子顕微鏡 (JSM-6700FT, JEOL).

【実験方法】

The samples were fabricated using gold disks and ITO substrat by standard electron beam lithography and following sputtering and lift-off process. The SSH chains are designed by different lengths and different gaps in order to compare. The diameter and the thickness of gold disks are 180 nm and 30 nm respectively. What's more, the chain arrays are arranged with a period of 2.5 um and 3.5 um for X scale, which rely on the lengths of the chains, and 0.75um for Y scale.

3. 結果と考察(Results and Discussion)

The SEM images are shown in Fig. 1, and they represent the different chain lengths with various

numbers of disks respectively. Panel (a) shows that the gap value of the long-range coupling is -10 nm, label (b) shows the gap value is 0 nm, label (c) shows the gap value is 10 nm and the label (d) shows the gap value is 20 nm. The topology is the property of bulk systems, as a consequence, the longer the chains are, the higher energy the topological structures can support, and eventually it reaches saturation and stop increasing. We firstly measure the extinction spectrum using these structures, and the results are consistent with the numerical simulations. Furthermore, we will try the PEEM measurements to observe the near-field enhancement. This work can realize the essence of topological physics in experiments.

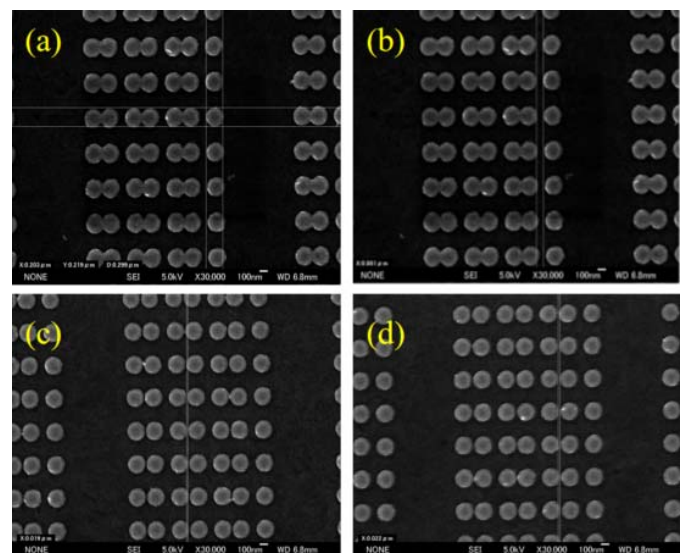


Fig. 1 The number of the chains are 7 and the total length is about 1.5 um.

4. その他・特記事項(Others)

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5. 論文・学会発表(Publication/Presentation) N/A

6. 関連特許(Patent) N/A