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Article / Book Information

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論文審査の要旨及び審査員

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論文審査の要旨 (2000 字程度)

This thesis described the design of electronic devices based on redox-active organic molecule and its porous coordination networks. The suitability of the thesis as a doctoral dissertation was judged on the basis of the impact and rarity of the thesis on the research field. In addition, the appropriate experimental methods and theoretical discussion were considered as a criterion. Firstly, the thesis described the resistive switching memory device based on a redox-active organic molecule which showed the exceptional switching stability and high retention. In particular, the molecular orientation and its correlation with switching phenomena were well determined by structure analysis and I-V characteristics measurement. In addition, the mechanistic study was included with elaborate discussion based on theoretical calculation, control experiments, and ex-situ measurements. This research would be expected as a high impact for the industrial field as well as research area. In second part, the redox-active porous coordination networks were utilized for the fabrication of chemiresistive humidity sensor. The synthesis of materials and fabrication methods were described in detail and the performance as a humidity sensor were well characterized. Especially, the sensing mechanism was nicely investigated by X-ray crystallography and spectroscopic measurement using proper experimental conditions. The third part described the structural design for tunable electrical properties using post-synthetic modification. Along with the previous chapter, the limitation of synthesized porous coordination network was overcome by synthetic approaches. Although post-synthetic modification was well established as a synthetic method, the attempt to tune the electrical properties would be useful to design electronic devices based on redox-active porous coordination networks. With the three research chapters, the introduction and outlook of thesis were properly described to show the background and current situation, and the future works.

Overall, this thesis is valuable to be a Ph.D dissertation in terms of rarity of electronic devices based on redox-active organic molecule and nobility for understanding electrical properties in redox-active system.

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