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Semiconductor Nanoparticle-based Gels as Photoactivated Gas Sensors

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Gels based on semiconductor nanoparticles are of scientific interest for applications in electrochemical sensing or catalysis, because they offer a unique combination of nanoscopic and macroscopic properties.[1,2,3,4] This work focuses on cadmium selenide/cadmium sulfide nanorods and their application as gas sensors.
The particles where synthesized following a synthesis route published by Carbone et al.[5], which allows for a narrow size distribution of the obtained particles. After the synthesis in organic solution, a phase transfer to aqueous solution is performed. To this, hydrogen peroxide is added, which leads to a gelation of the nanoparticles and the formation of a hydrogel. Depending on the method of drying, either xerogels (ambient drying) or aerogles (supercritical drying) can be obtained.[6]
Upon excitation with light, excitons will be formed inside the gel. Due to the band structures of the nanoparticles, the electron can scatter over multiple rods inside the gel network, increasing the exciton lifetime. By applying a voltage, a photocurrent is obtained, which should change if exposed to gaseous analytes, therefore allowing these gels to be used as gas sensors.[4,7,8,]

References

[1] Liu, W., Hermann, A., Bigall, N. C., Rodriguez, P., Wen, D., Oezaslan, M., Schmidt, T. J., Gaponik, N. and Eychmüller, A., Acc. Chem. Res. 2015, 48, 154-162.
[2] Fu, G., Yan, X., Chen, Y., Xu, L., Sun, D., Lee, J. and Tang, Y., Adv. Mater. 2018, 30, 1704609.
[3] Liu, X., Sun, J. and Zhang, X., Sens. Actuators B Chem. 2015, 211, 220-226.
[4] Schlosser, A., Meyer, L. C., Lubkemann, F., Miethe, J. F. and Bigall, N. C., Phys. Chem. Chem. Phys. 2019, 18, 9002-9012.
[5] Carbone, L., Nobiel, C., De Giorgi, M., Della Sala, F., Morello, G., Poma, P., Hytch, M., Snoeck, E., Fiore, A., Franchin, I. R., Nadasan, M., Silvestre, A. F., Chiodo, L., Kudera, S., Cingolani, R., Krahne, R. and Manna, L., Nano Letters 2007, 7, 2942-2950.
[6] Rusch, P., Lübkemann, F., Borg, H., Eckert, J. G., Dorfs, D. and Nadja, N. C., J. Chem. Phys. 2022, 156, 234701.
[7] Wen, X., Sitt, A., Yu, P., Toh Y. R. and Tang, J., Phys. Chem. Chem. Phys. 2012, 14, 3505-3512.
[8] Miethe, J. F., Luebkemann, F., Schlosser, A., Dorfs, D., and Bigall, N. C., Langmuir 2020, 36, 4757- 4765.

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