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PII:	S0169-4332(18)31120-6
DOI:	https://doi.org/10.1016/j.apsusc.2018.04.158
Reference:	APSUSC 39157
To appear in:	Applied Surface Science

Received Date:23 January 2018Revised Date:3 April 2018Accepted Date:16 April 2018



Please cite this article as: S. Seo, B. Park, Y. Kim, H. Uk Lee, H. Kim, S. youb Lee, Y. Kim, J. Won, Y. Jung Kim, J. Lee, Black Phosphorus Quantum Dot-based Field-effect Transistors with Ambipolar Characteristics, *Applied Surface Science* (2018), doi: https://doi.org/10.1016/j.apsusc.2018.04.158

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Black Phosphorus Quantum Dot-based Field-effect

Transistors with Ambipolar Characteristics

Soonjoo Seo^a, Byoungnam Park^b, Youngjun Kim^b, Hyun Uk Lee^{a,*}, Hyeran Kim^a, Seung youb Lee^a, Yooseok Kim^a, Jonghan Won^a, Youn Jung Kim^c and Jouhahn Lee^{a,*}

^aAdvanced Nano-Surface Research Group, Korea Basic Science Institute (KBSI), Daejeon 34133, Republic of Korea

^bDepartment of Materials Science and Engineering, Hongik University, Seoul, 04066, Republic of Korea

^cCenter for Research Facilities, Andong National University, Andong 36729, Republic of Korea

Semiconductor quantum dots have intriguing electronic and optical properties distinguished from bulk owing to quantum confinement effects. Among the two-dimensional materials, black phosphorus (BP) has generated enormous excitement due to its tunable direct band gap and high p-type semiconducting properties. We prepared BP quantum dots (BPQDs) by simple liquid exfoliation using distilled water and ethanol solution. Our structural data show the uniform distribution of circular BPQDs with the average lateral size of 4.08 \pm 0.66 nm and the height of 1.13 \pm 0.32 nm. We fabricated BPQD field-effect transistors (FETs) to investigate the electrical characteristics of BPQD-based devices and found that both hole and electron transport can be probed in the BPQD FETs. The BPQD FETs exhibited unprecedentedly ambipolar behavior with the mobility of 0.11 cm²V⁻¹s⁻¹ for p type and 0.09 Download English Version:

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