Supporting Information

Table S1. Structures, band gaps and characters of group V and group IV-VI monolayers.

Class		Structure	Type	Band gap(eV)	Charater
group V monolayers		(N)Nitrogene	β[a]	5.90 [1]	insulator
		(P)Phosphorene	α[b]	1.0 [2]	direct
			β	~2.0 [3]	indirect
		(As)Arsenene	α	0.83 [4]	indirect
			β	2.49 [5]	indirect
		(Sb)Antimonene	α	0.28 [6]	indirect
			β	2.28 [5]	indirect
		(Bi)Bismuthene	β	0.03[7]	direct
group IV-VI monolayers	isoelectronic analogs to group V	SiS	α	1.44 [8]	indirect
			β	2.26 [8]	indirect
		GeSe	β	1.54 [9]	direct
		SnTe	(001)[c]		TCI[d][10]
	binary counterparts of group V	GeS	β	2.32 [9]	indirect
		SnS	β	1.96 [9]	indirect
		PbTe	(001)		TCI[10]

[a] β refers to buckled or graphene-like. [b] α refers to puckered or black-phosphorene-like

[c] (001) refers to (001) monolayer of rocksalt IV−VI semiconductors.

[d] TCI: topological crystalline insulator;

[e] SOC: spin-orbit coupling;

Reference:

[1] V. O. Özçelik, O. Ü. Aktürk, E. Durgun, S. Ciraci, *Phys. Rev. B* 2015, **92**, 125420;

[2] H. Liu, A. T. Neal, Z. Zhu, Z. Luo, X. Xu, D. Tománek, P. D. Ye, *ACS nano* 2014, **8**, 4033-4041;

[3] Z. Zhu, D. Tománek, *Phys. Rev. lett.* 2014, **112**, 176802;

[4] C. Kamal, M. Ezawa, *Phys. Rev. B* 2015, **91**, 085423;

[5] S. Zhang, Z. Yan, Y. Li, Z. Chen, H. Zeng, *Angew. Chem. Int. Ed.* 2015, **54**, 3112-3115;

[6] G. Wang, R. Pandey, S. P. Karna, *J. Am. Chem. Soc.* 2015, **7**, 11490-11496;

[7] E. Aktürk, O. Ü. Aktürk, S. Ciraci, *Phys. Rev. B* 2016, **94**, 014115;

[8] Z. Zhu, J. Guan, D. Liu, D. Tománek, *ACS Nano* 2015, **9**, 8284-8290;

[9] J. H. Yang, Y. Zhang, W. J. Yin, X. G. Gong, B. I. Yakobson, S. H. Wei, *Nano lett.* 2016, **16**, 1110-1117;

[10] C. Niu, P. M. Buhl, G. Bihlmayer, *Phys. Rev. B*, 2015, **91**, 201401.