Electronic Supplementary Material (ESI) for Nanoscale.

Biomolecules Sensing by Surface Enhanced Raman Scattering of Monolayer Janus Transition Metal Dichalcogenide

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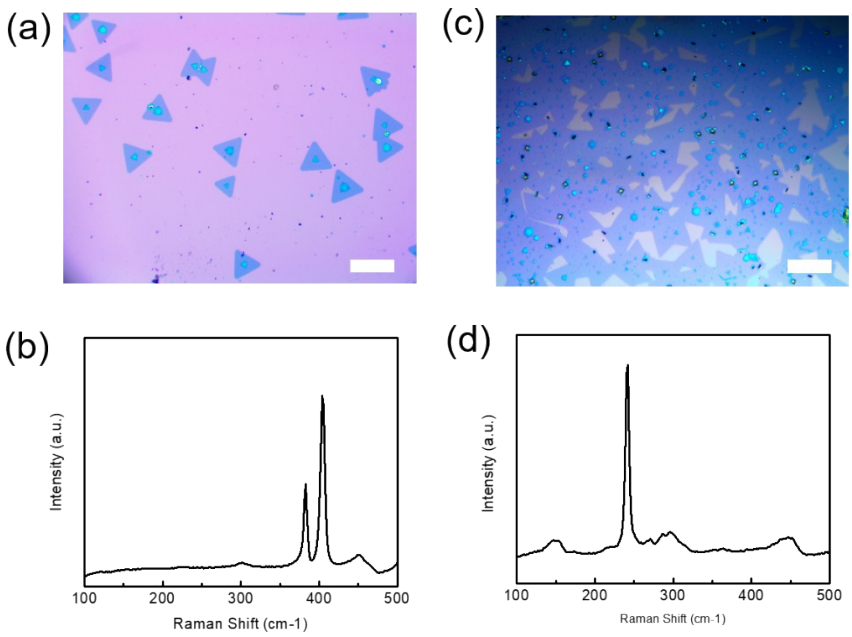

Figure S1. (a-b) Optical images and Raman spectra of CVD-grown monolayer MoS_2. (c-d) Optical images and Raman spectra of CVD-grown monolayer $MoSe_2$. Scale bar is 50 μm.

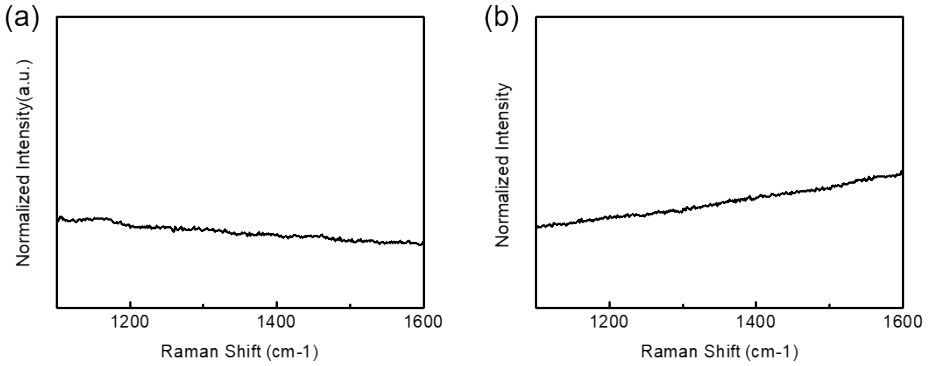

Figure S2. (a-b) Raman spectra of glucose absorbed onto monolayer MoS_2 and $MoSe_2$. No visible peaks were observed because of weak interactions of glucose and MoS_2 and $MoSe_2$.

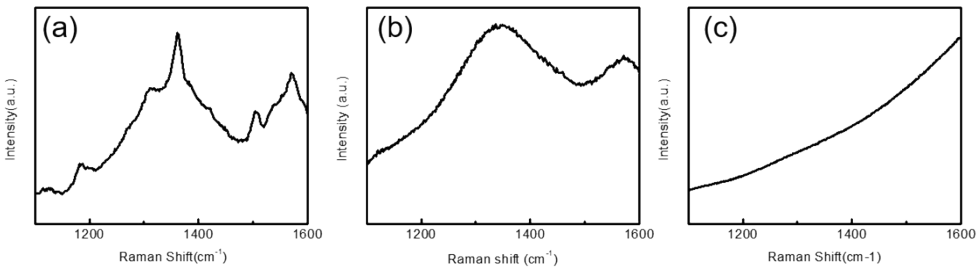

Figure S3. Raman spectra of glucose on monolayer Janus with various excitation lasers. (a) 532 nm laser (b) 633 nm laser (c) 785 nm laser. Raman spectra with 633 nm and 785 nm laser only show two wide peaks and a high broad background. Careful deconvolution is needed to identify hidden peaks in the broad peaks and background.

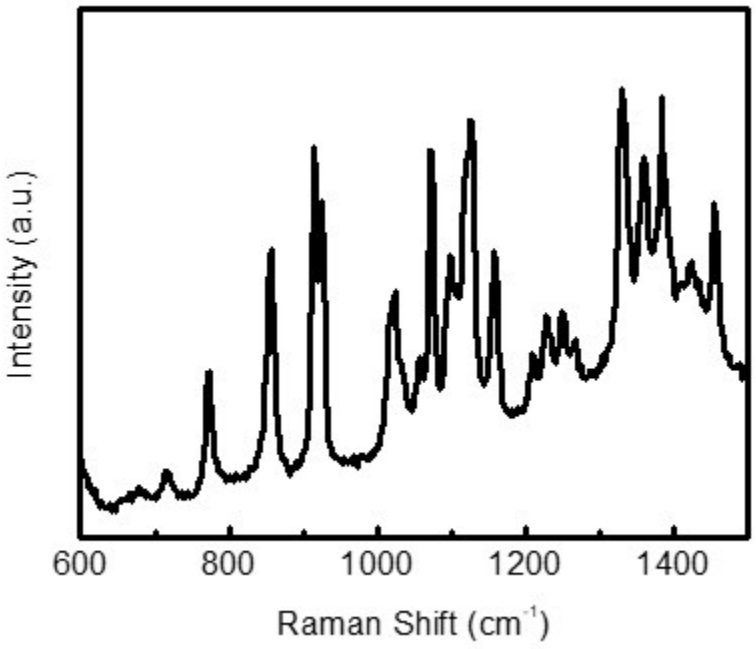

Figure S4. Raman spectra of solid glucose powder.

Table S1. Raman peaks position and corresponding vibrational modes in glucose powder.[1]

Raman peak position	Vibrational mode
715	C-C-O rocking and ring distortion
773	C rocking and ring distortion
855	C rocking coupled to C-O-C stretching
927	Ring breathing mode

1010	Ring distortions via asymmetric stretching
1074	C-O-C asymmetric stretching
1124	C-ring distortions and C-C asymmetric stretching
1165	C-O-C bending coupled to C-OH stretching
1206	H wagging
1228	C-O stretching
1268	Symmetric C-O-C stretching coupled to C-H wagging
1328	C-O stretching
1360	C-C stretching coupled with O-H bending
1453	C bending

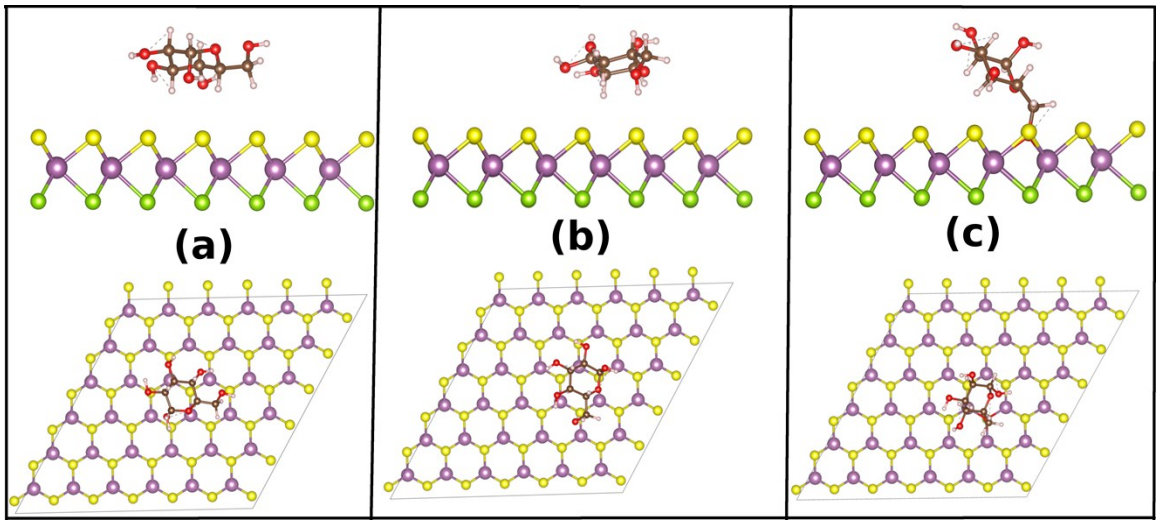

Figure S5. Various configurations of glucose on monolayer Janus. The grey, red and white atoms are carbon, oxygen and hydrogen in glucose respectively. The yellow, purple and green atoms are sulfur, molybdenum and selenium in Janus respectively. (a) the free CH_2OH group of glucose pointing away from the surface. (b) the free CH_2OH group of glucose pointing towards the surface. (c) glucose is covalently bonded onto Janus.

Reference:

(1) Sharma, B.; Bugga, P.; Madison, L. R.; Henry, A. I.; Blaber, M. G.; Greeneltch, N. G.; Chiang, N.; Mrksich, M.; Schatz, G. C.; Van Duyne, R. P. Bisboronic Acids for Selective, Physiologically Relevant Direct Glucose Sensing with Surface-Enhanced Raman Spectroscopy. *J. Am. Chem. Soc.* **2016**, *138* (42), 13952–13959.