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Raman Enhancement Effect on Thin GaSe Flake and Its Thickness Dependence LIN QUAN, YUQING SONG, GUANGHUI ZHANG, YUKUN WU, KE JIN, HUAIYI DING, NAN PAN, YI LUO, XIAOPING WANG, Univ of Sci Tech of China — Chemical enhancement is one of the important mechanisms in surface-enhanced Raman spectroscopy, however, its origin is still under debate. Two dimensional (2D) layered material is thought to be a strong candidate to investigate the chemical mechanism of Raman enhancement because it has flat surface, well defined structure and without the interference of electromagnetic enhancement. Herein we report the systematic studies of Raman enhancement effect on the gallium selenide (GaSe) flake by using copper phthalocyanine (CuPc) molecule as a probe. It is found that the Raman signal of CuPc on the monolayer GaSe can be significantly increased by one order of magnitude than that on the SiO2/Si substrate. Meanwhile, the enhancement effect is found to decrease with increasing the thickness of GaSe flake. The origin of the Raman enhancement is attributed to the chemical mechanism resulted from the charge transfer between the GaSe flake and the detected molecules. The supposition is further verified by the investigation of Raman enhancement effect of CuPc with different thicknesses on the GaSe flake. Our work will shed more light on the understanding of the chemical mechanism for Raman enhancement and expand more practical applications of GaSe.

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