Electronic Supplementary Information

Formation of monolayer and few-layer hexagonal boron nitride nanosheets *via* surface segregation

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Thickness estimation

Fe (LMM) transition	Substrate (sputtered for 0.4 min)	Buffer layer	Monolayer stack	Bilayer stack
Peak-to-peak magnitude	10695	7237	4871	3441
Thickness		0.31 nm	0.65 nm	0.91 nm

To estimate the thickness of h-BN films, we used Fe (LMM) Auger transition with the electron inelastic mean free path of ~1.2 nm for iron at ~703 eV based on inelastic attenuation model of the following expression. By considering the carbon contamination, we used the peak-to-peak magnitude of Fe (LMM) transition from the AES spectra after sputtered for 0.4 min as the $I_{\mathrm{sub,\ pure}}$. However, we used the peak-to-peak magnitude of Fe (LMM) transition from the AES spectra without sputtering as I_{sub} because argon ion sputtering can damage the structure of h-BN and the buffer layer, and the carbon contamination at the buffer layer and h-BN regions is much less than at the bare substrate surface.

$$I_{\mathrm{sub}} = I_{\mathrm{sub,pure}}\exp[-(nd_0)/\lambda\sin(\theta)]$$

where I_{sub} is the peak-to-peak magnitude of the Fe (LMM) transition prior to sputtering by ion-gun sputtering, $I_{\mathrm{sub,pure}}$ is the peak-to-peak magnitude of the Fe (LMM) peak after removing most of the carbon contamination (*i.e.*, 0.4 min sputtering time), n is the number of h-BN, d_0 is the theoretical thickness of single h-BN sheet (~3.4 Å), θ is the electron take-off angle (42° for the present Auger instrument), and λ is the inelastic mean free path (IMFP) of the Auger electrons for iron.

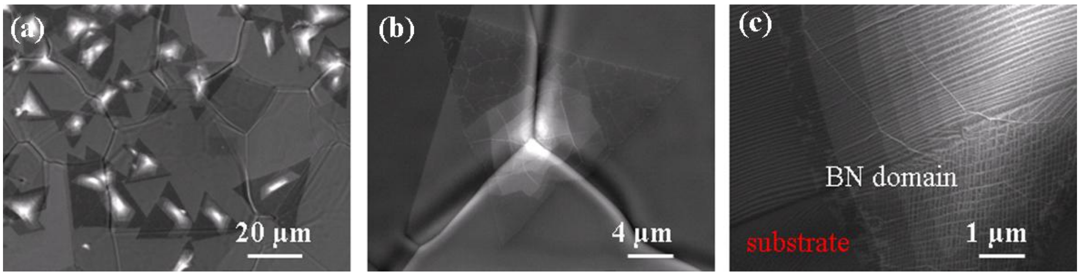

Figure S1. Typical SEM images of h-BN nanosheets synthesized by surface segregation from Fe-Cr-Ni alloy doped with boron and nitrogen.

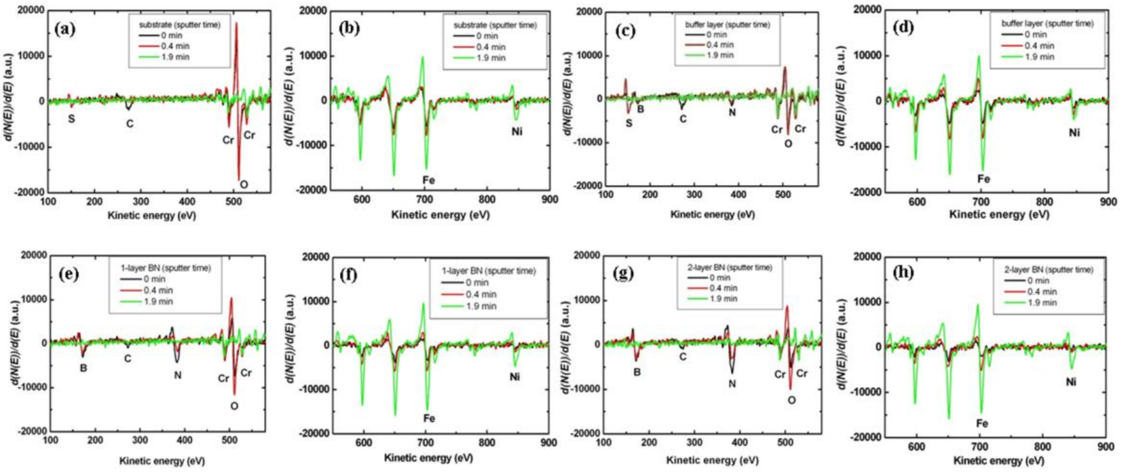

Figure S2. AES spectra show elemental evolution as a function of sputtering time, acquired at (a)-(b) substrate region, (c)-(d) B-N buffer layer region, (e)-(f) monolayer h-BN region, and (g)-(h) bilayer h-BN region of the sample in Figure S3.

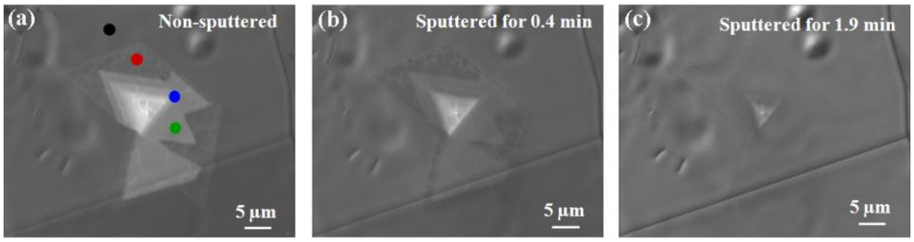

Figure S3. SEM images of h-BN flakes acquired before and after sputtered for different times. The black, red, blue, and green spots represent the substrate, B-N buffer layer, monolayer h-BN, and bilayer h-BN, respectively.

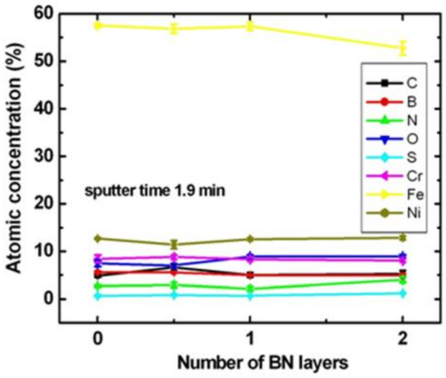

Figure S4. Atomic concentration of h-BN sample after sputtered for 1.9 min.