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## SUPLEMENTARY INFORMATION

**Figure S1- A, B:** ATR-IR spectrum of the bilayer in direct contact, (**A**) the ATR-IR spectrum of the entire region. (**B**) Zoom of the region where is demonstrated the presence of the two PBA layers. **C** The CrCr isolated film. **D** The FeCr isolated film.



**Figure S2**- AFM 3D topography image 5x5 μm2. Bottom: CrCr 20 seconds electrodeposition time. Top: Final bilayer after depositing a 20 seconds FeCr layer.



**Figure S3-** Hysteresis loop at 2K of a 175 nm thickness film of CrCr. *Inset*: Derivative (blue curve) of the first branch of the hysteresis loop (black curve) for determining the coercive field of the material. Bottom: Hysteresis loop at 2K of a 135 nm thickness film of FeCr. *Inset*: Derivative (blue curve) of the first branch of the hysteresis loop (black curve).



**Figure S4**- Hysteresis loops of the **CrCr** film isolated at T=2 K obtained by SQUID measurements in perpendicular and parallel configuration.