

Supplementary Information

Endotaxial Growth of Fe_xGe Single-Crystals on Ge(001) Substrates

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Additional experiments and discussions

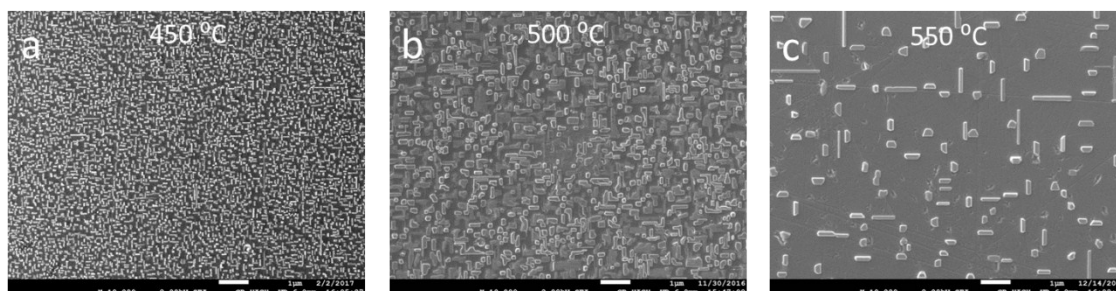


Figure S1. SEM images of deposited Fe_xGe islands on Ge (001) substrate at various temperatures.

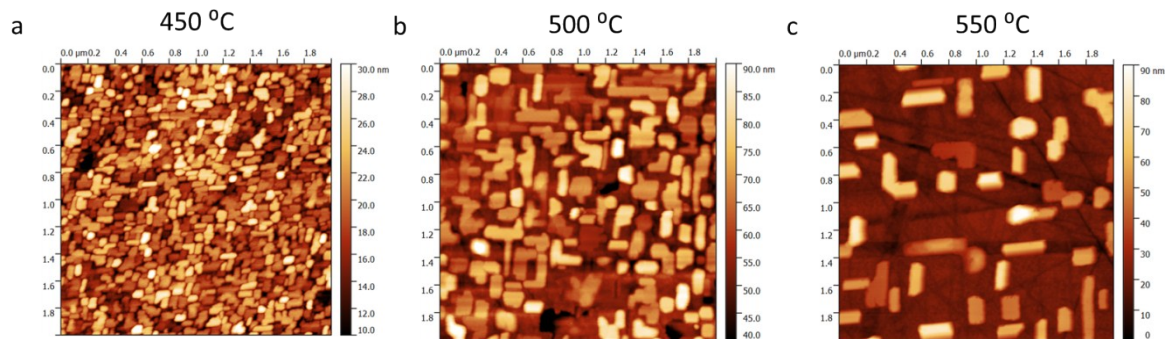


Figure S2. AFM of deposited Fe_xGe islands on Ge (001) substrate at various temperatures.

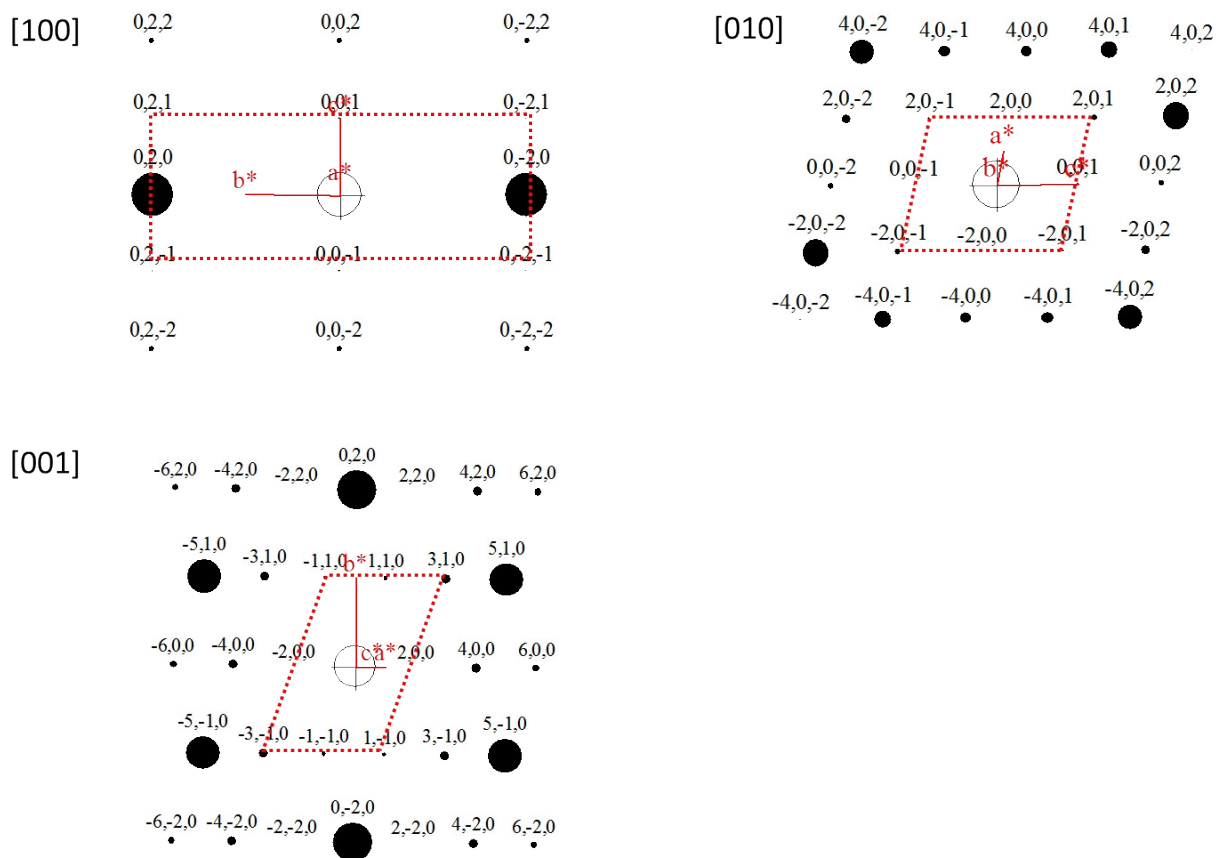


Figure S3. Simulated diffraction pattern from three zone axes of monoclinic FeGe .

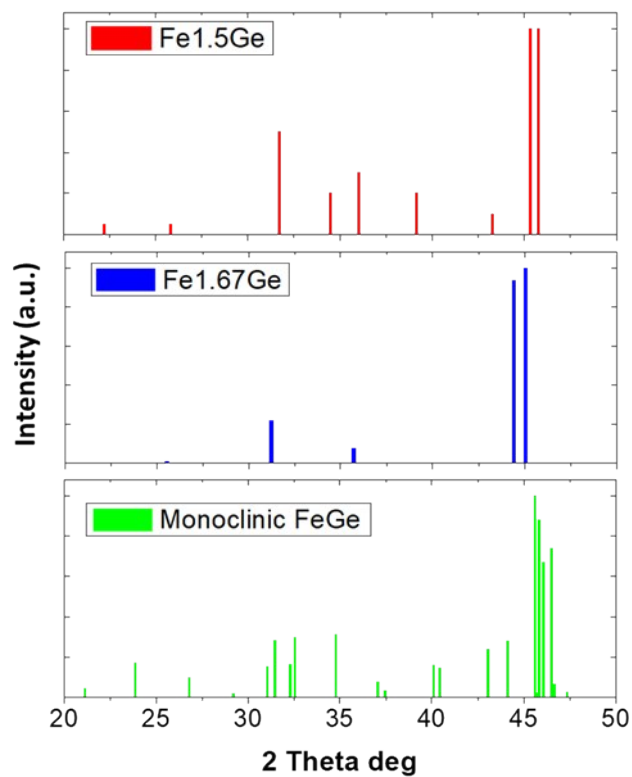


Figure S4. Standard XRD pattern of Fe_{1.5}Ge, Fe_{1.67}Ge and FeGe.

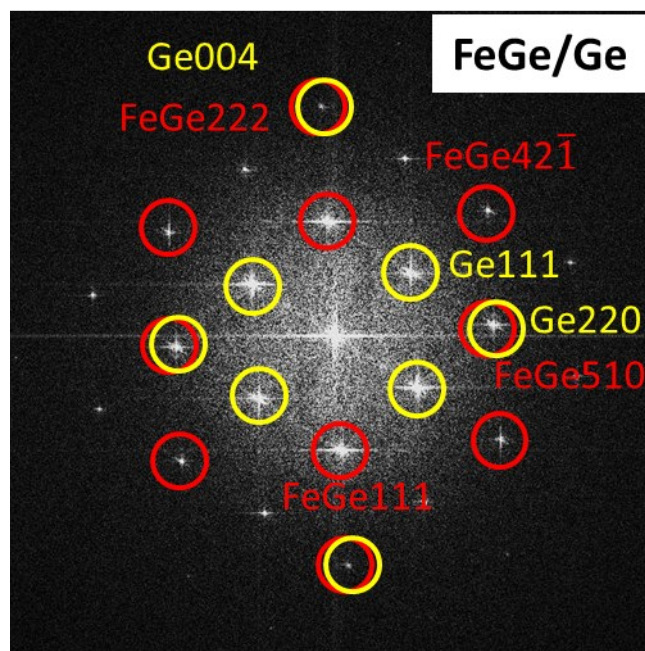


Figure S5. FFT of the monoclinic FeGe / Ge interface generated from HRTEM in Figure 3(a).

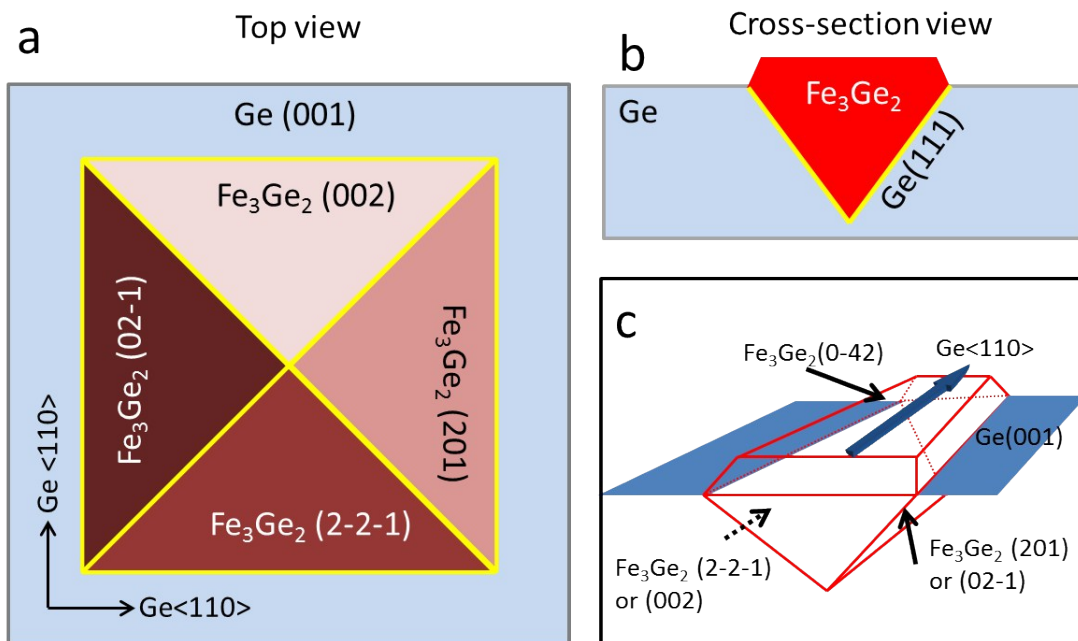


Figure S6. Schematic drawing of growth orientation of Fe_3Ge_2 island on Ge (001) substrate. (a) Top view of the substrate showing two major growth directions of $\text{Fe}_{13}\text{Ge}_8$ island, along Ge $\langle 110 \rangle$, perpendicular to each other. The four interface facets of Fe_3Ge_2 are (002), (201), (2-2-1) and (02-1) respectively; (b) side view of the FeGe island after FIB cut, displaying the interface relationship between Fe_3Ge_2 and Ge (111); (c) 3D illustration of the island and substrate endotaxial relationship.

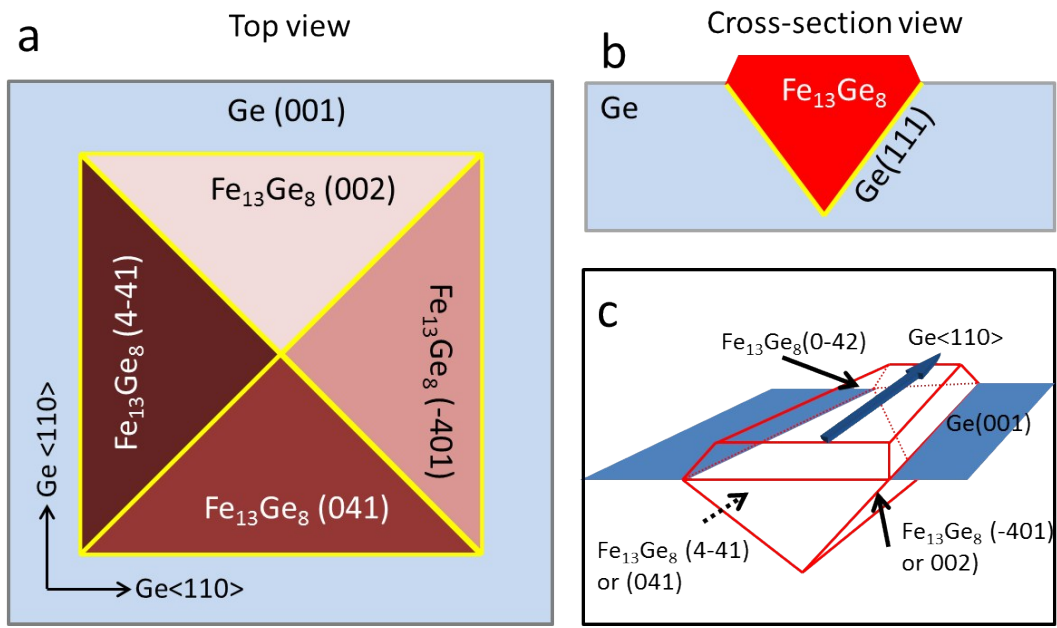


Figure S7. Schematic drawing of growth orientation of Fe₁₃Ge₈ island on Ge (001) substrate. (a) Top view of the substrate showing two major growth directions of Fe₁₃Ge₈ island, along Ge <110>, perpendicular to each other. Red top facet is Fe₁₃Ge₈ (0-42), the four interface facets of Fe₁₃Ge₈ are (4-41), (002), (-401) and (041) respectively; (b) side view of the FeGe island after FIB cut, displaying the interface relationship between Fe₁₃Ge₈ and Ge (111); (c) 3D illustration of the island and substrate endotaxial relationship.

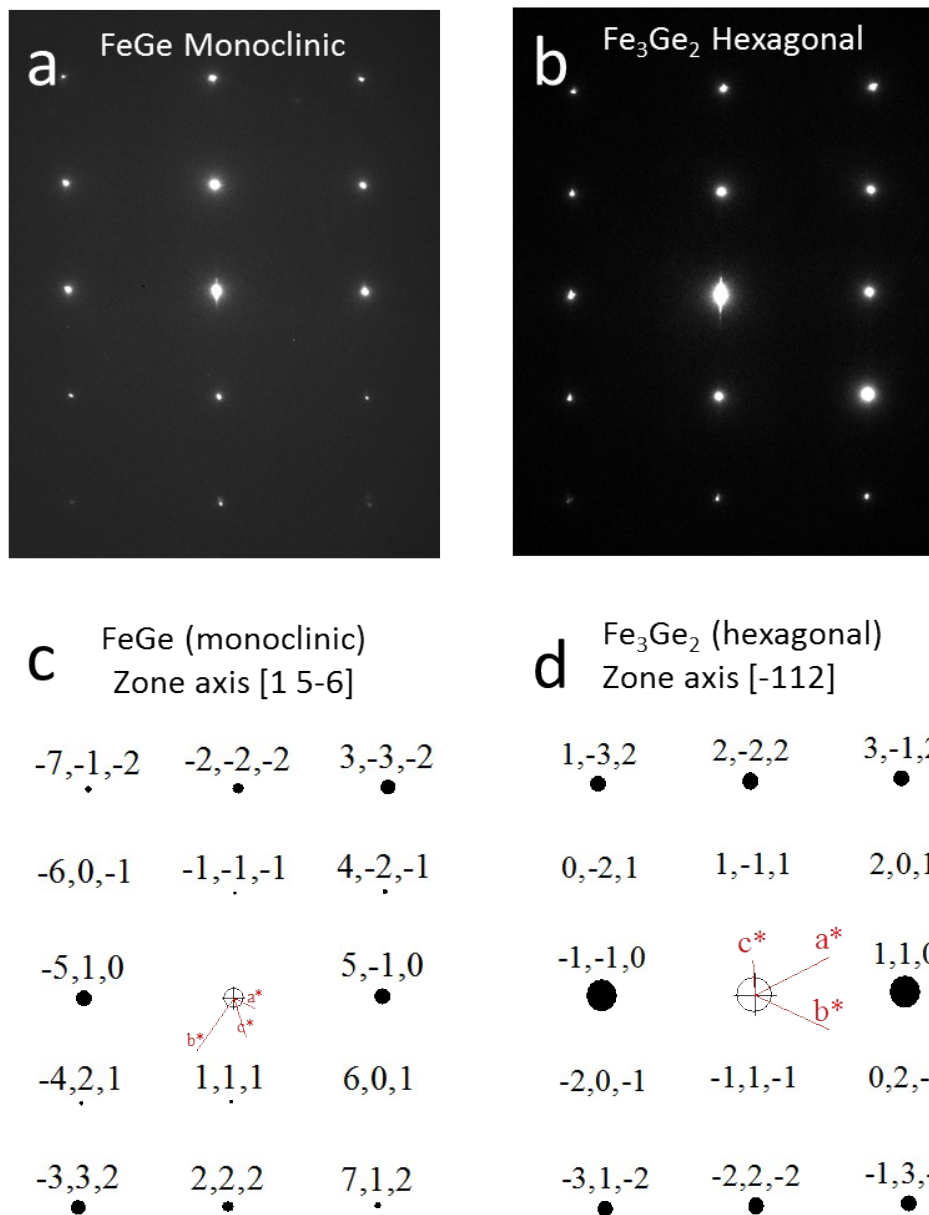


Figure S8. Similar electron diffraction pattern of monoclinic and hexagonal phases. SAED of (a) monoclinic FeGe, (b) hexagonal Fe₃Ge₂; Simulated reciprocal lattice of (c) monoclinic FeGe, (d) hexagonal Fe₃Ge₂.

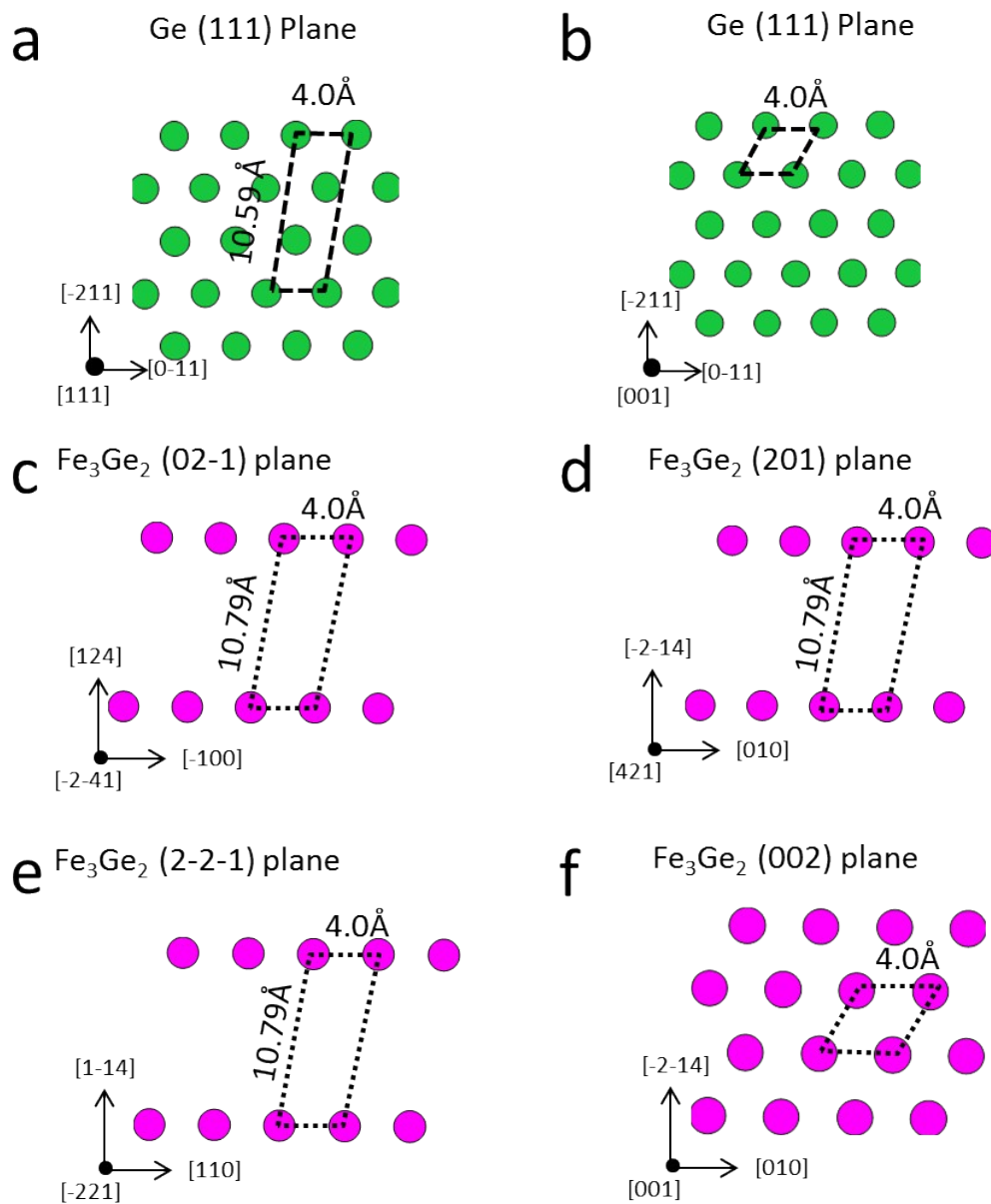


Figure S9. Computer simulated atomic arrangement of interface planes of cubic Ge and hexagonal Fe_3Ge_2 respectively. (a, b) Ge (111) plane, while (c-f) Fe_3Ge_2 (02-1), (201) (2-2-1) and (002) respectively.

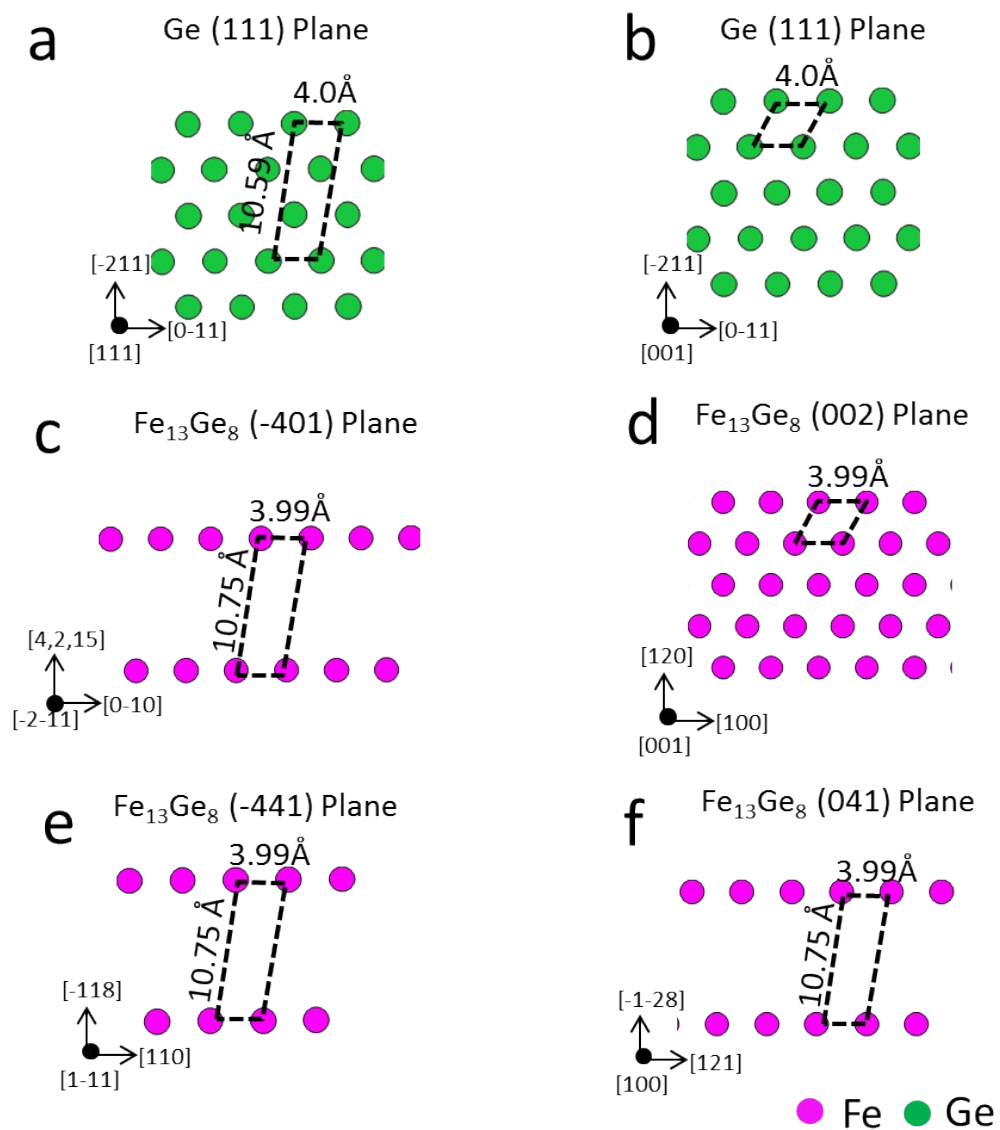


Figure S10. Computer simulated atomic arrangement of interface planes of cubic Ge and hexagonal $\text{Fe}_{13}\text{Ge}_8$ respectively. (a, b) Ge (111) plane, while (c-f) $\text{Fe}_{13}\text{Ge}_8$ (-401), (002) (-441) and (041) respectively.

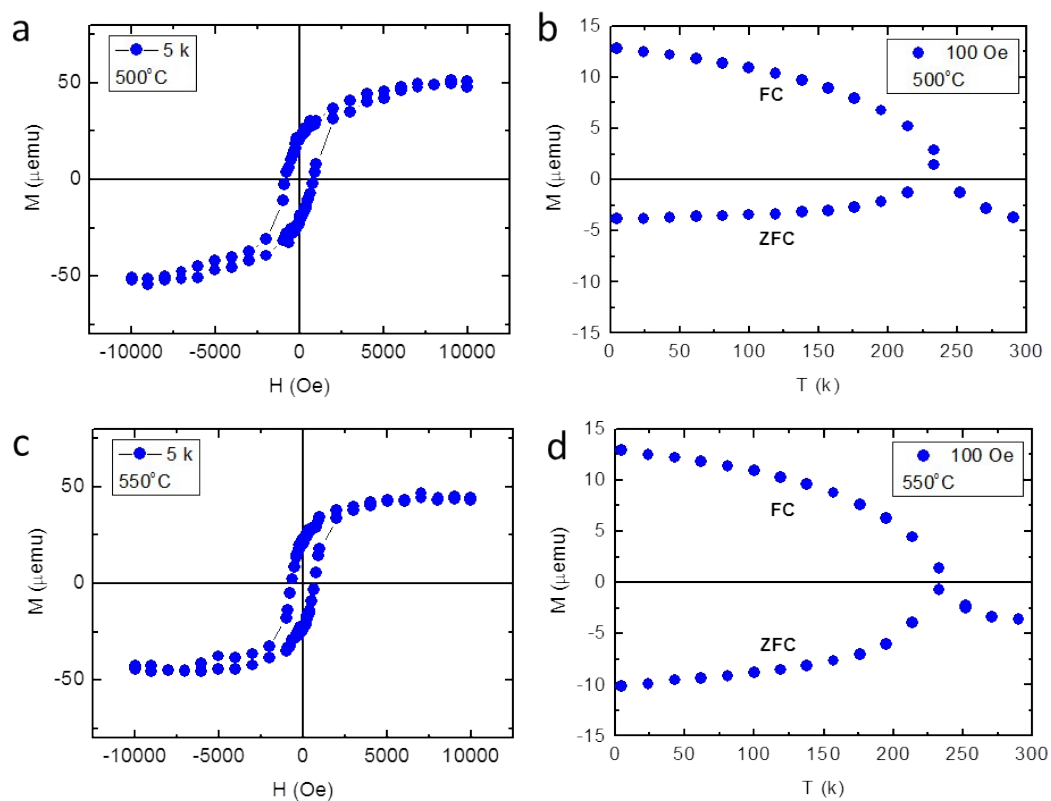


Figure S11. The magnetization curves of Fe_xGe at 5 K for samples deposited at (a) 500°C and (c) 550°C. The zero-field-cooled (ZFC) and field-cooled (FC) magnetizations at 100 Oe from 5 to 300 K for samples at (b) 500°C and (d) 550°C.