Supplementary Materials

Microscopic correlation between magnetostriction and magnetic damping

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S1. Strain dependence of magnetization of $(Fe_{1-x}Co_x)_4N$ and $Ni_{1-y}Co_y$
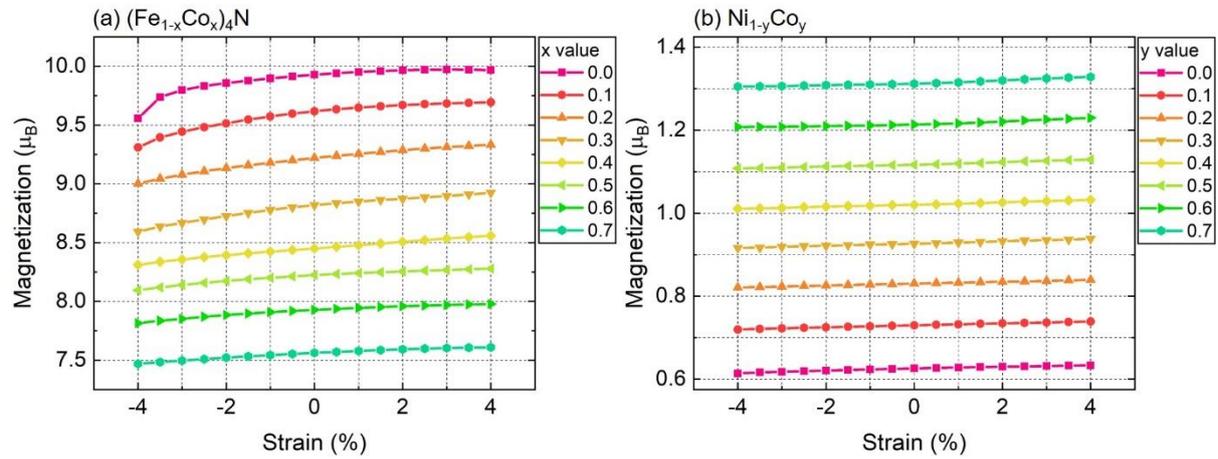

FIG. S1. Strain dependence of magnetization for (a) $(Fe_{1-x}Co_x)_4N$ with varying x values and (b) $Ni_{1-y}Co_y$ with varying y values. Gridlines are added for clarity.

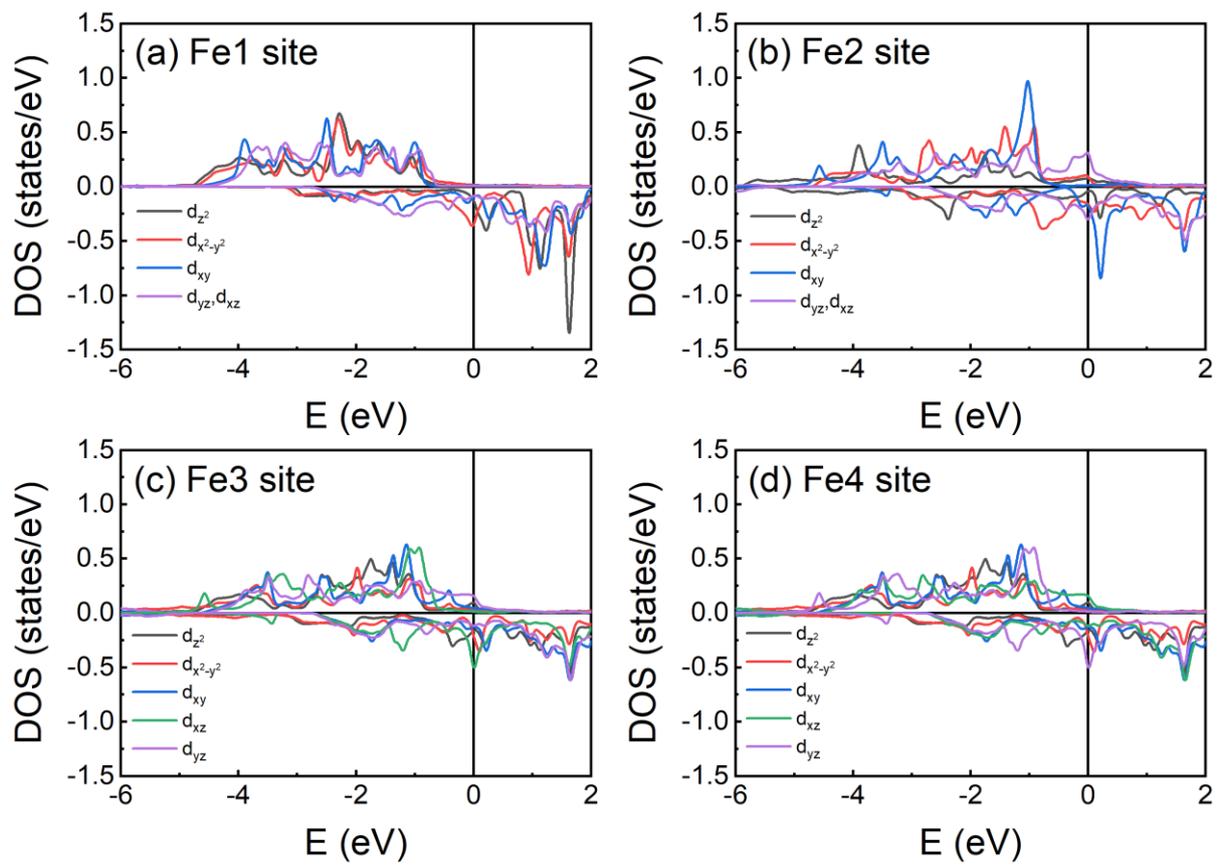S2. Atomic-resolved partial density of states of tetragonally distorted Fe_4N

FIG. S2. Partial density of states for (a) Fe1, (b) Fe2, (c) Fe3, (d) Fe4 sites of tetragonally distorted Fe_4N

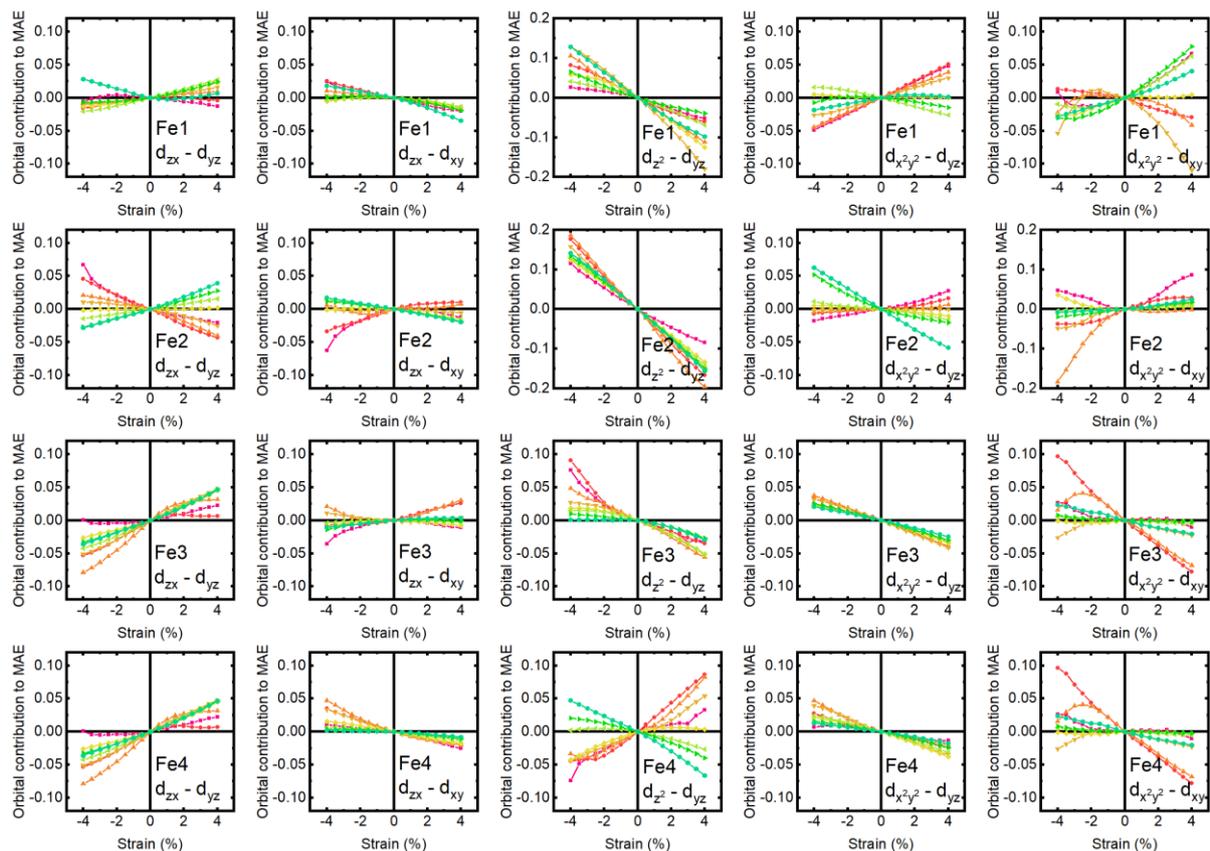## S3. Orbital contribution to the MAE for $(Fe_{1-x}Co_x)_4N$

FIG. S3. Strain dependence of the $\downarrow\Rightarrow\downarrow$ normalized orbital contribution to the MAE calculated from second-order perturbation analysis of $(Fe_{1-x}Co_x)_4N$, divided by atomic site (from top to bottom: Fe1; Fe2; Fe3; Fe4) and orbital combination (from left to right: $d_{zx} - d_{yz}$; $d_{zx} - d_{xy}$; $d_{z^2} - d_{yz}$; $d_{x^2-y^2} - d_{yz}$; $d_{x^2-y^2} - d_{xy}$).

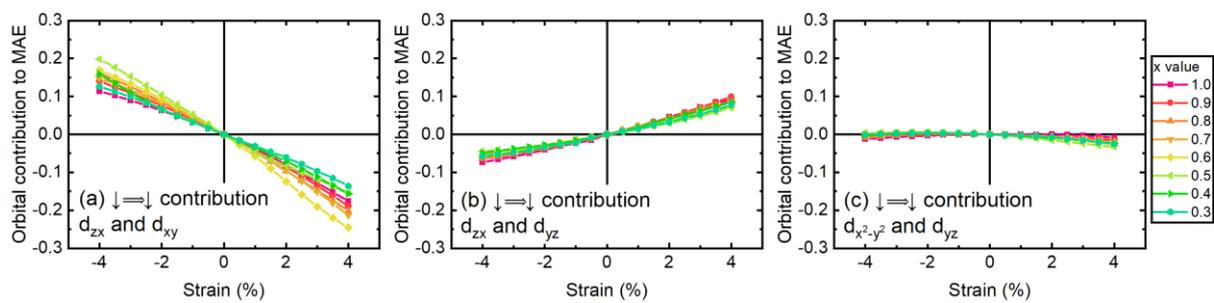## S4. Other orbital contribution to the MAE for Ni$_{1-y}$Co$_y$

FIG. S4. Strain dependence of the $\downarrow\Rightarrow\downarrow$ normalized orbital contribution to the MAE calculated from second-order perturbation analysis of (a) $d_{zx} - d_{xy}$, (b) $d_{zx} - d_{yz}$, (c) $d_{x^2-y^2} - d_{yz}$ of Ni$_{1-y}$Co$_y$