Influence of interface mixing on magnetism of Au_4Co_{11} multilayers

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- Few thoughts on Au/Co multilayers

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- Summary

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- This study approaches the system from the other direction: Au as the starting point

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- Probing magnetism induced at the Au sites

Induced Au magnetism in Au_4Co_{11}

- Au $L_{2,3}$ edge XMCD was measured for Au_4Co_{11} [F. Wilhelm *et al.*, Phys. Rev. B **69**, 220404(R) (2004)]

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- Spin moment sum rule for the $L_{2,3}$ edge

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- *Let us have a look ...*

Geometry model

- *fcc* geometry, (111) interface, ABC stacking

- Intra-planar interatomic distances are identical for each layer (weighted average of Au and Co crystals)

- Distances between layers taken from experiment of F. Wilhelm *et al.*

Au concentration:

		1	2	3	4
interdiffusion within 4 layers		0.70	0.55	0.45	0.30
interdiffusion within 2 layers		1.00	0.70	0.30	0.00
clean interface		1.00	1.00	0.00	0.00

interlayer distances: [Å]

2.051   2.051   2.051   2.141   2.203   2.266   2.356   2.266   2.203   2.141   2.051   2.051   2.051

1   2   3   4   5   6

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geometry at the interface
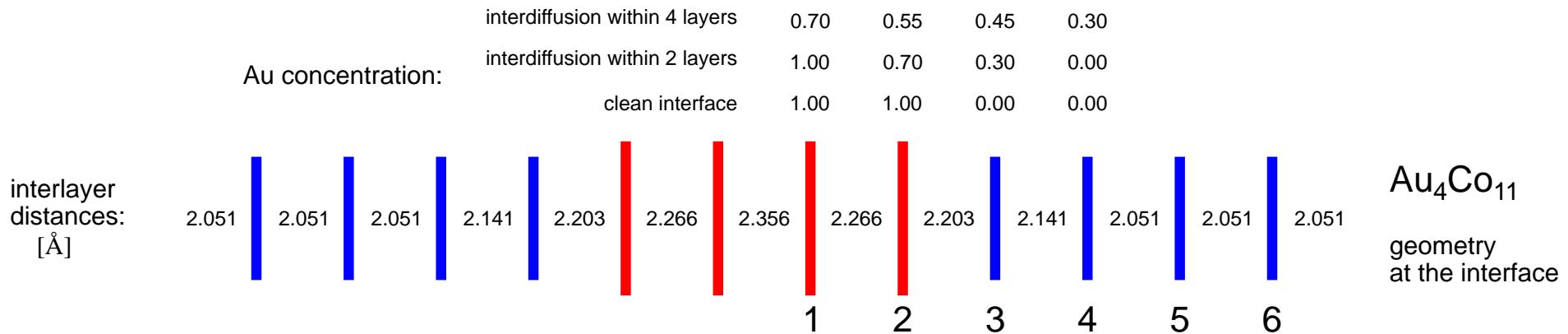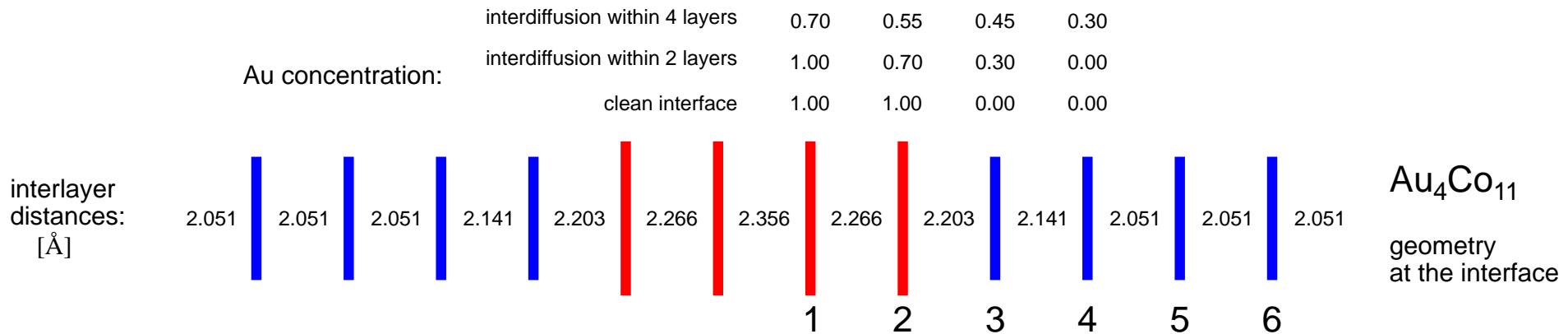
- For comparison, an auxiliary model Co_4Co_{11} system is used (same geometry, all atoms are Co)

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  http://olymp.cup.uni-muenchen.de/ak/ebert/SPRKKR

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Local moments inside Au spheres
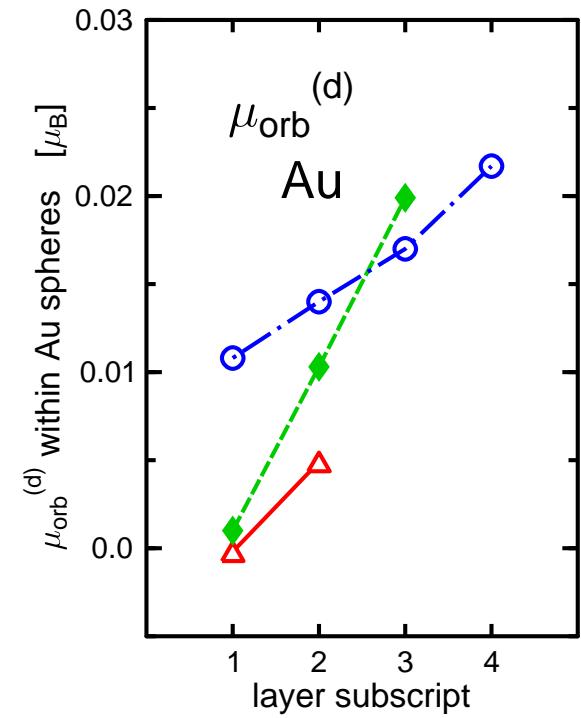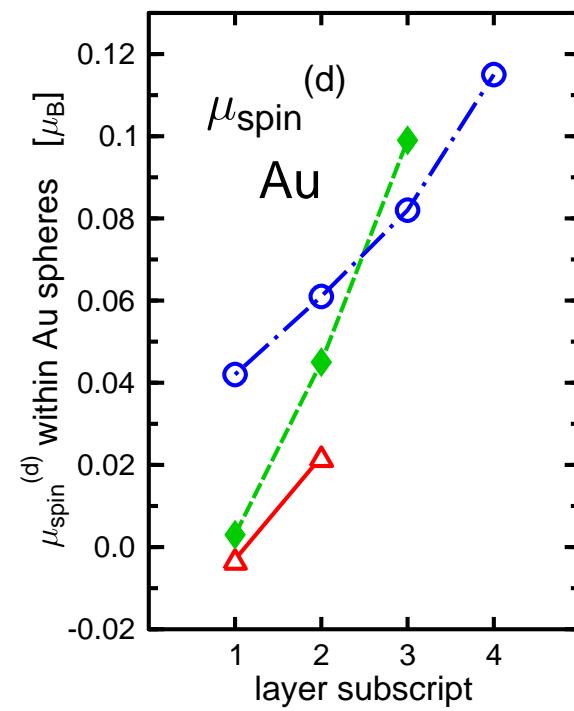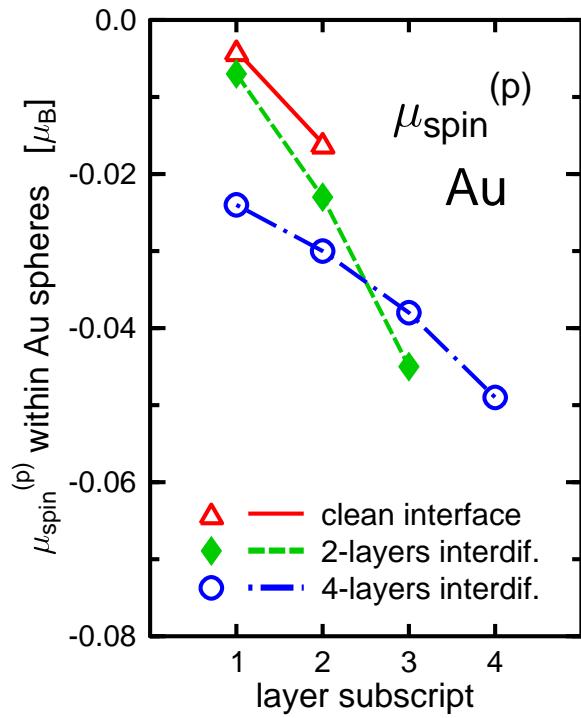
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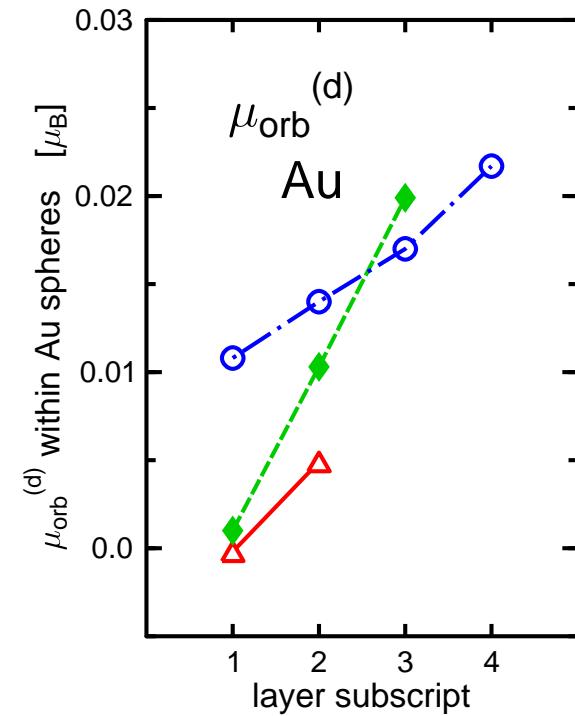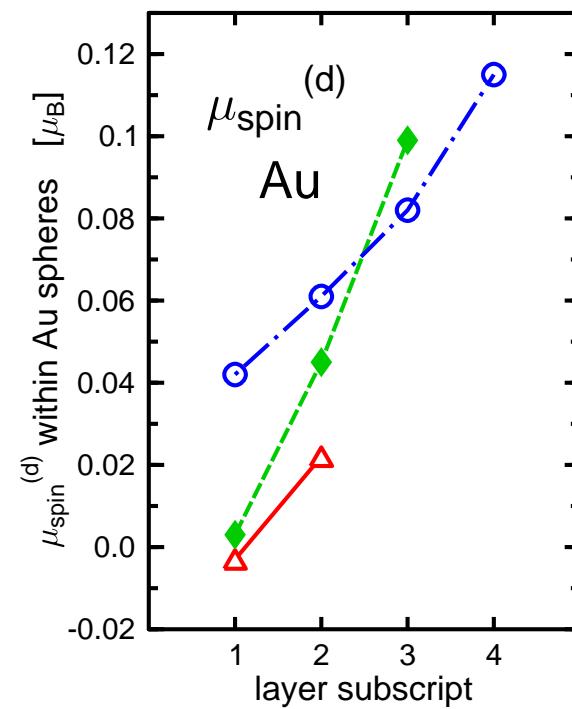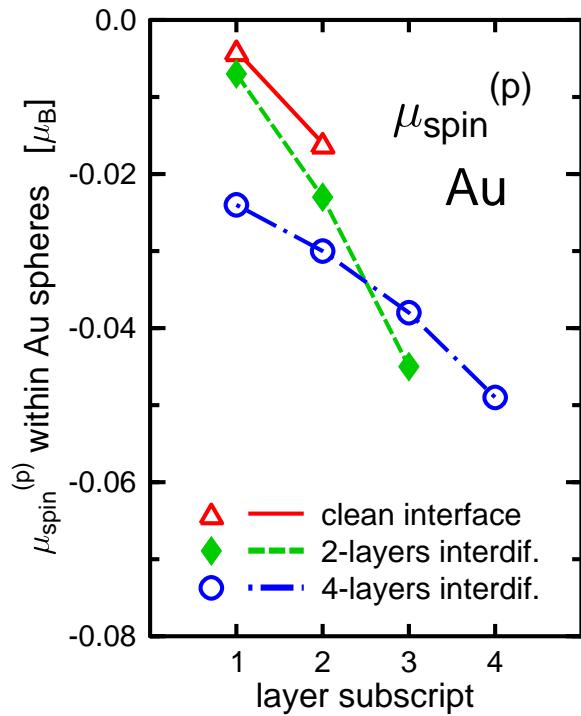
- More Co means more magnetism

Local moments inside Co spheres

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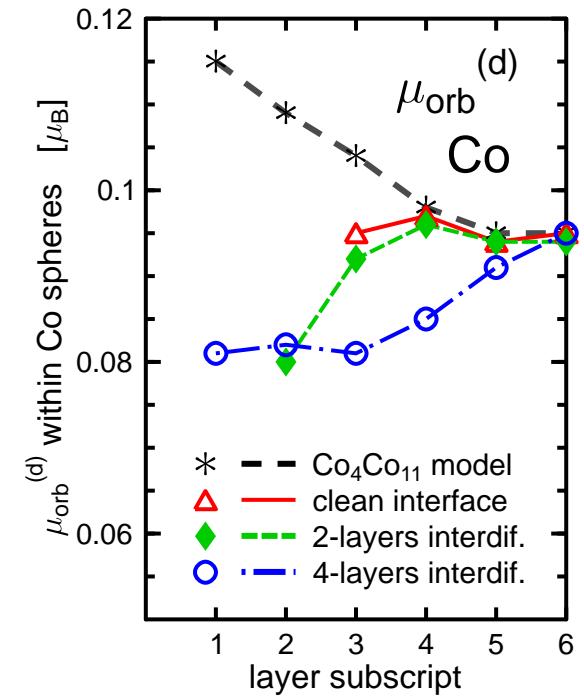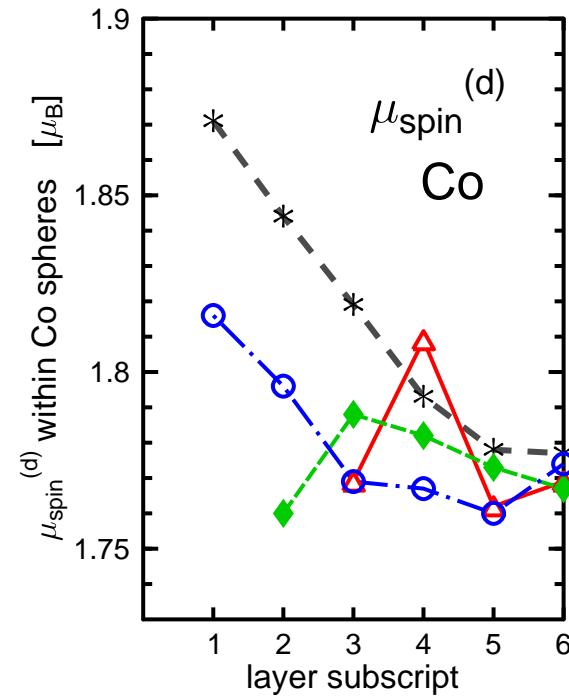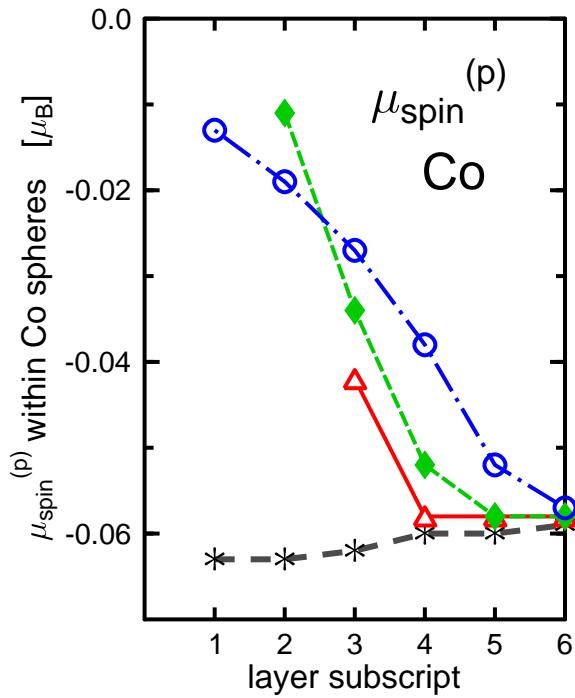
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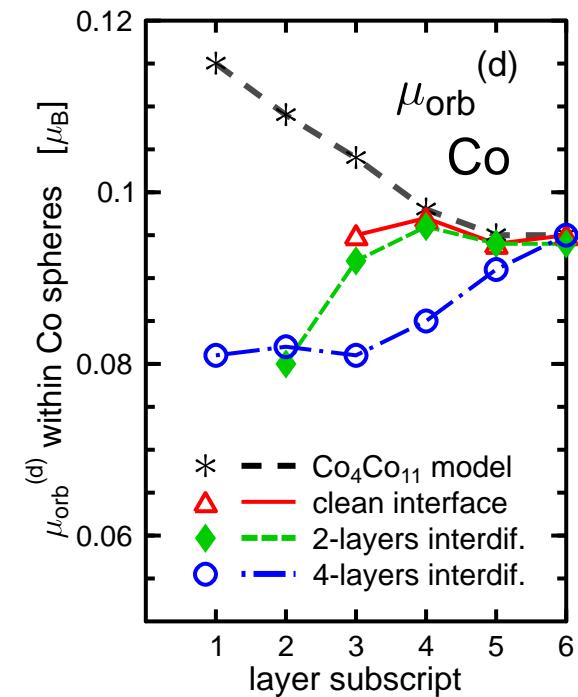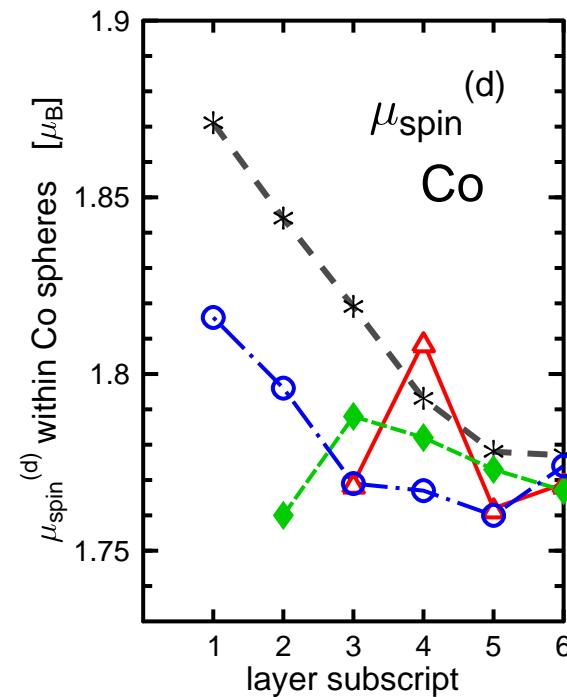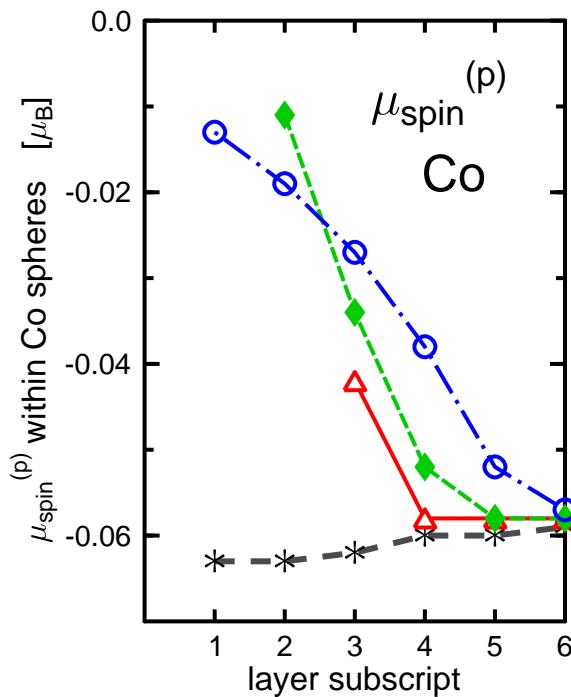
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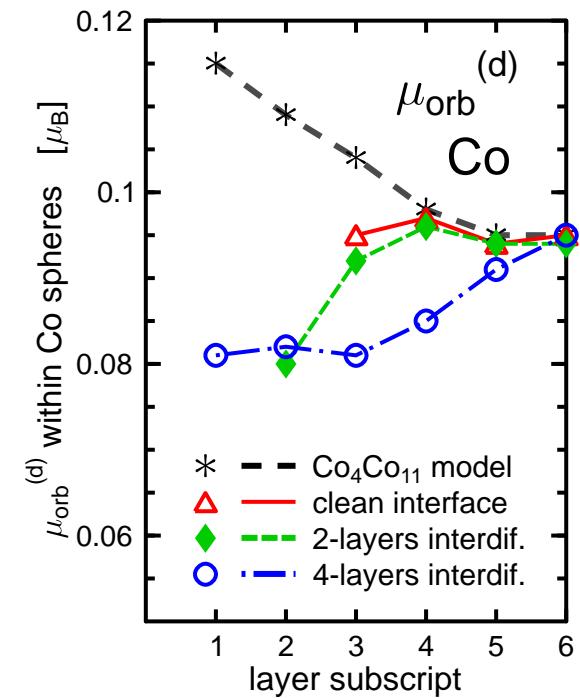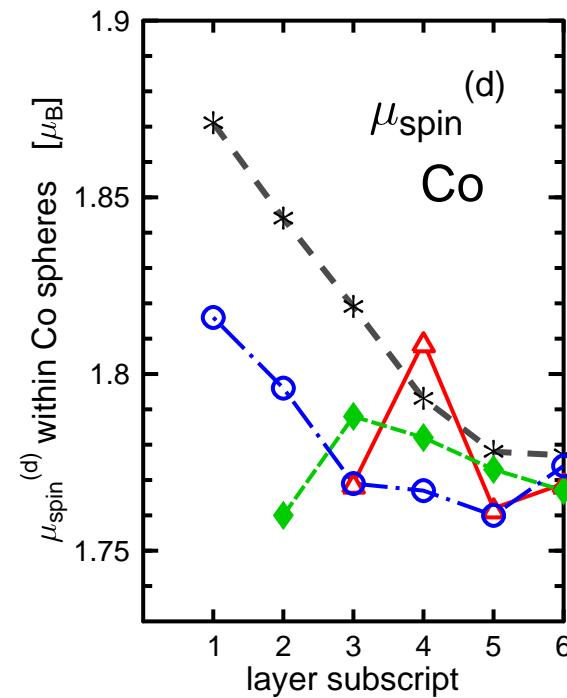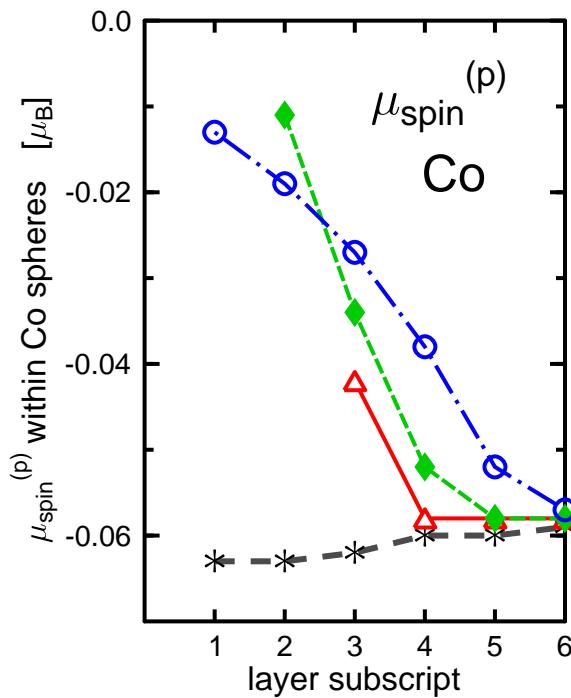
- Latice expansion enhances magnetism
- Chemistry complicates the geometry

Quantities related to sum rules
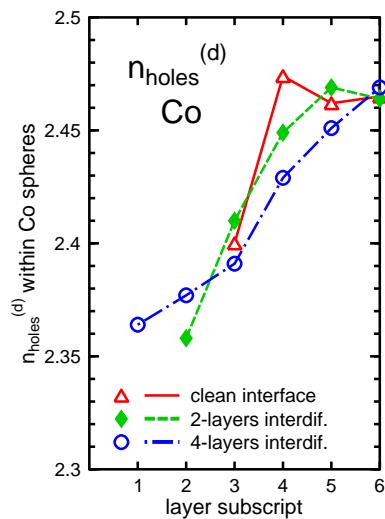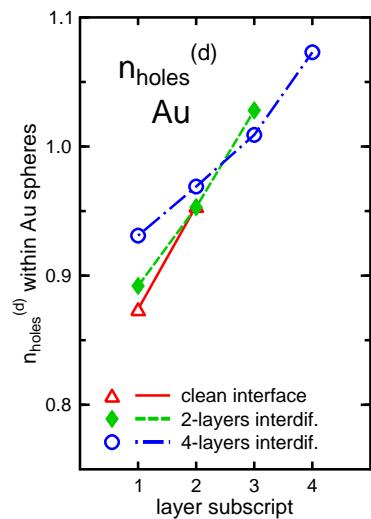
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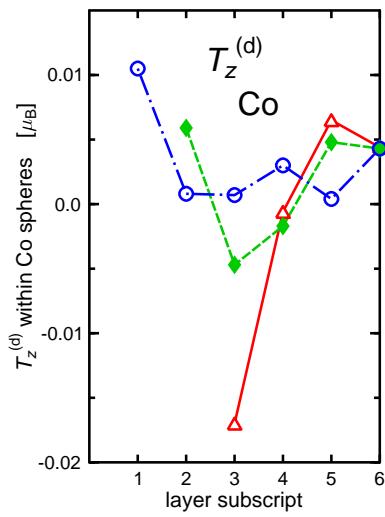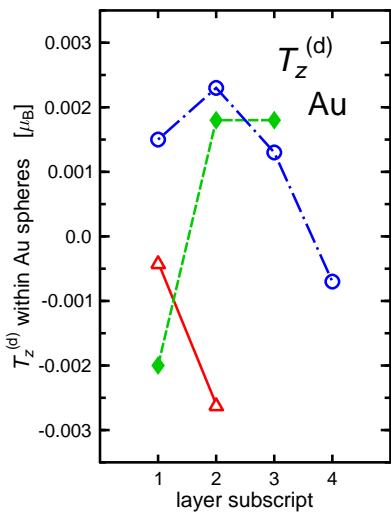
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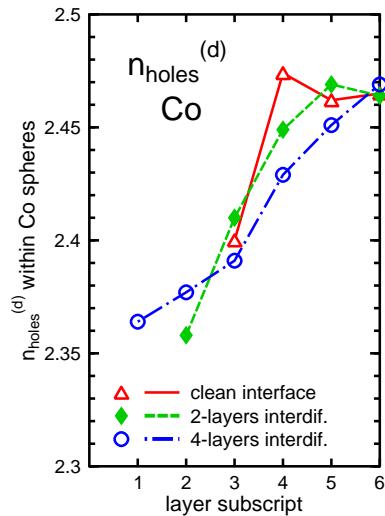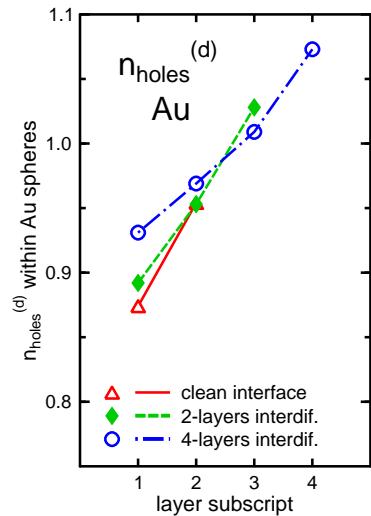
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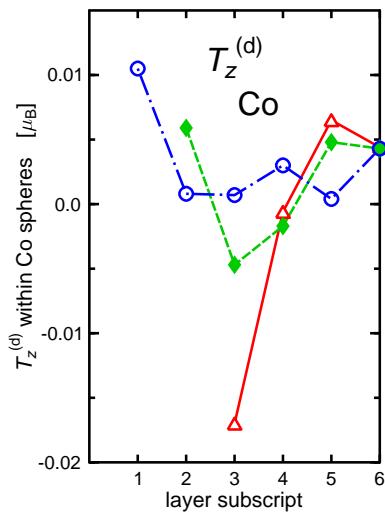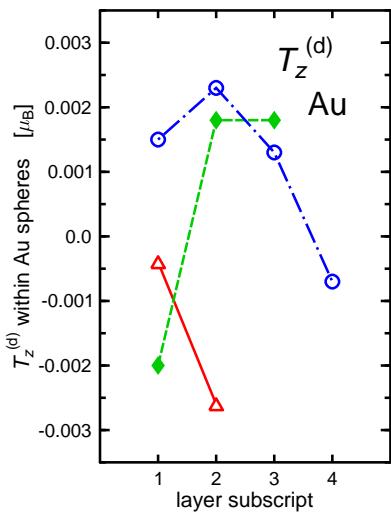
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$n_{holes}^{(d)}$ and $T_z^{(d)}$ vary from site to site

Spin moment sum rule for Au sites
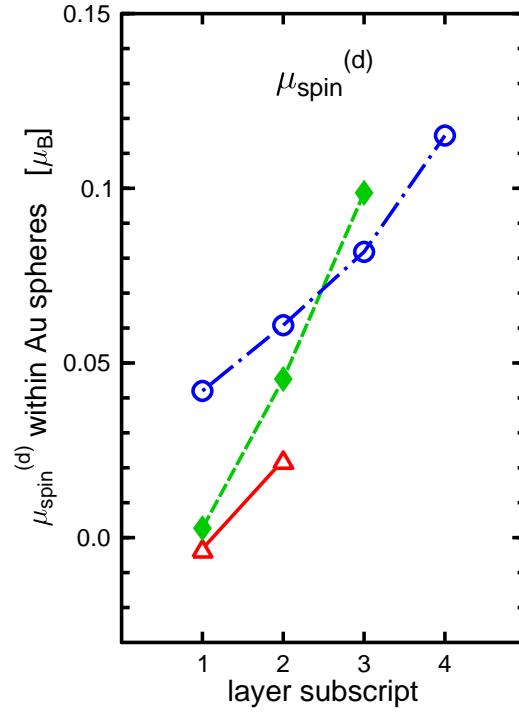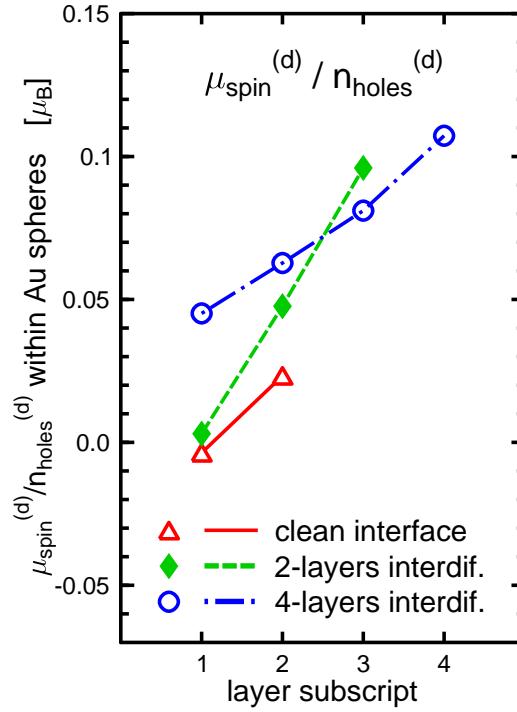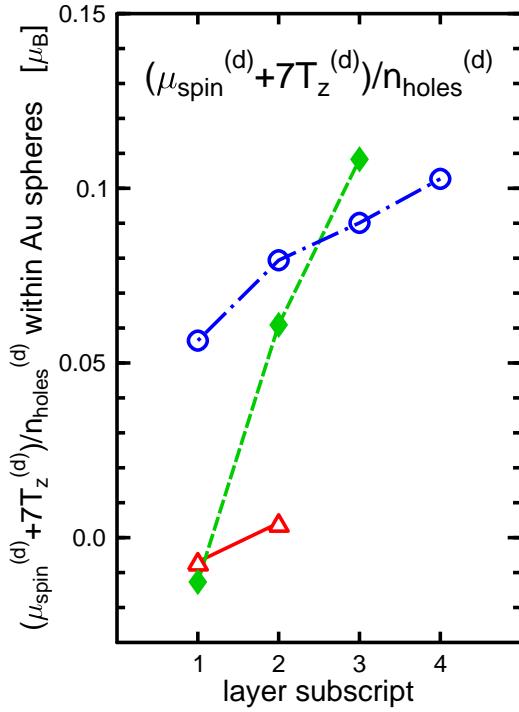
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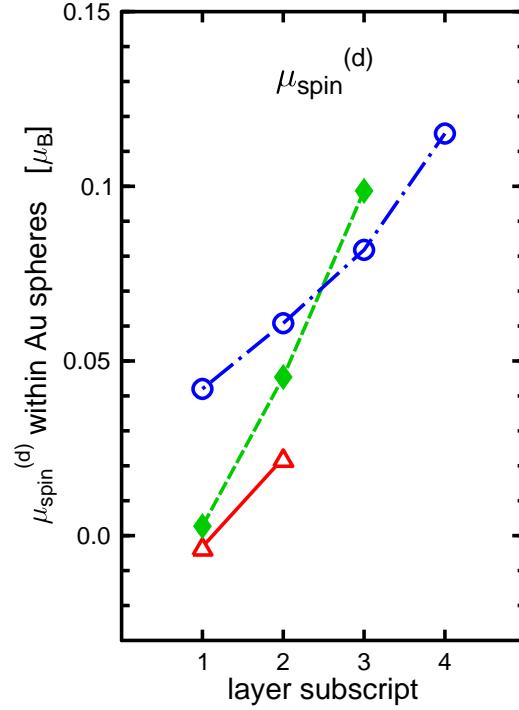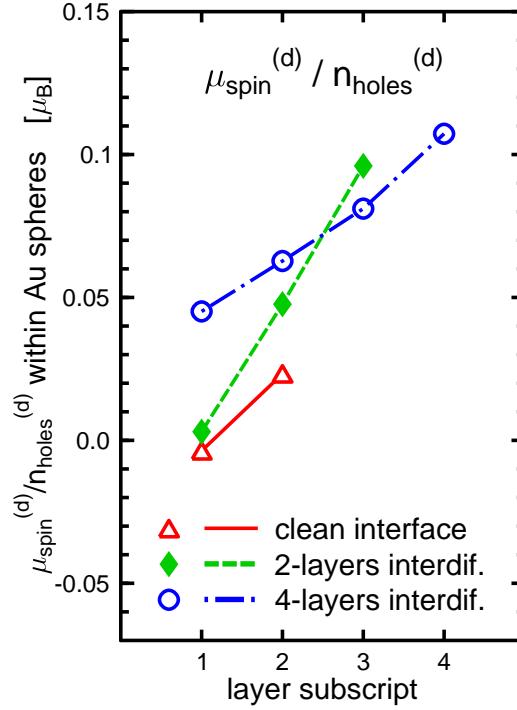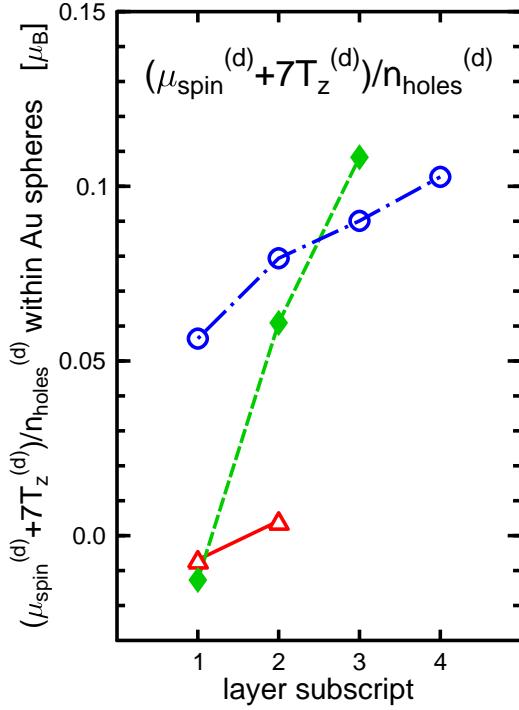
Variations of $n_{holes}^{(d)}$ and $T_z^{(d)}$ do not really matter

# Orbital moment sum rule for Au sites
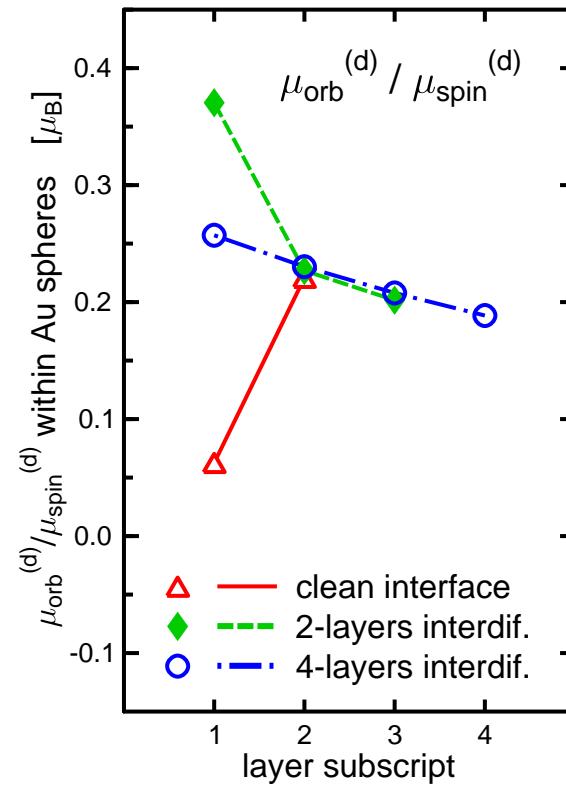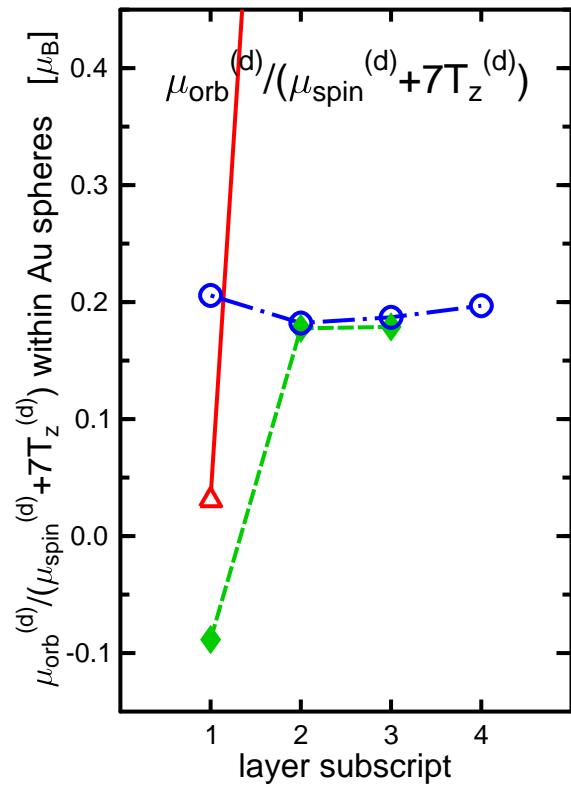
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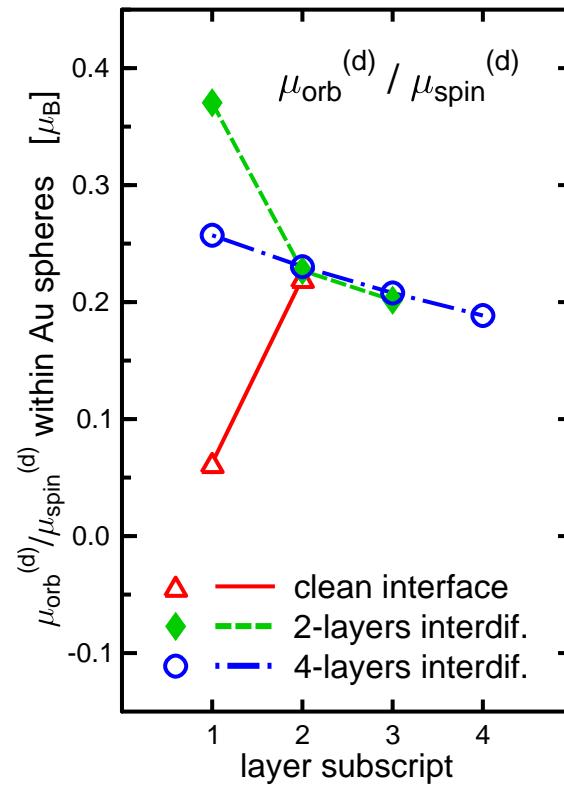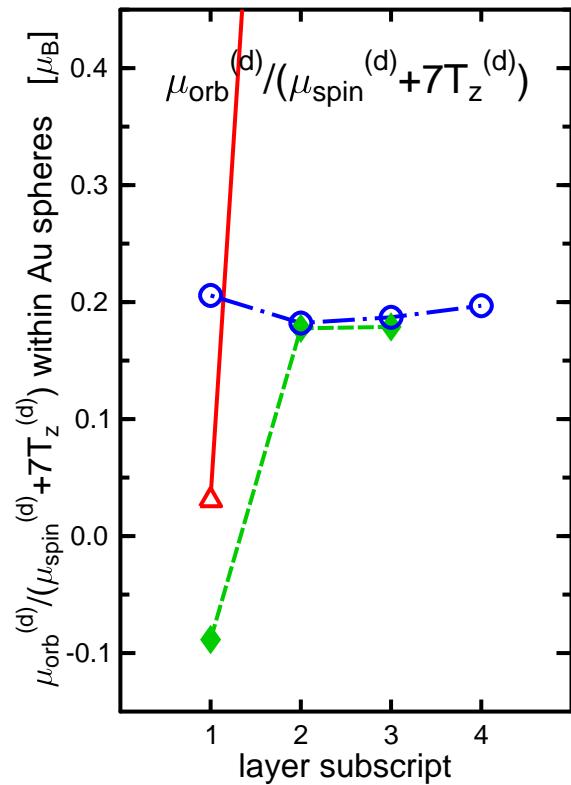
- $T_z^{(d)}$ contributes significantly

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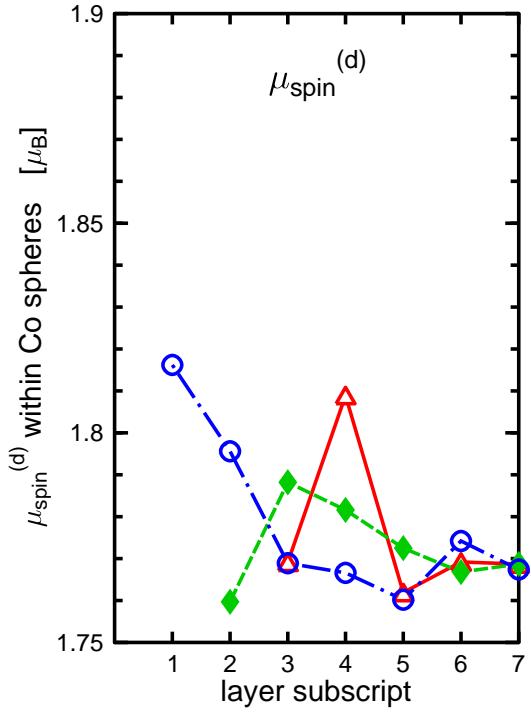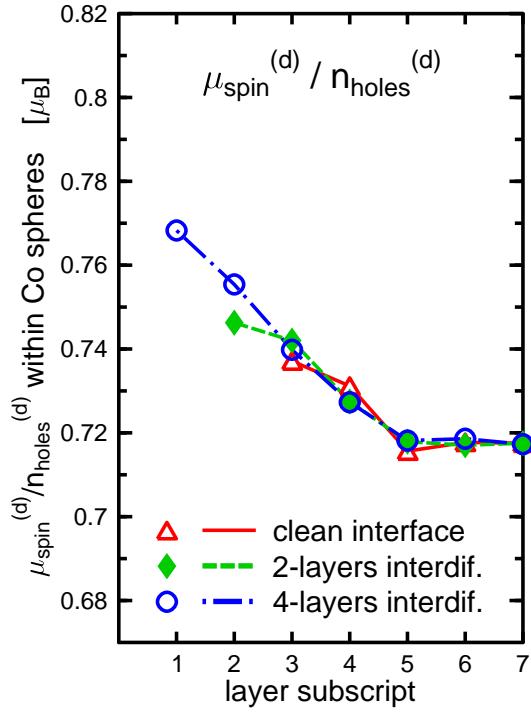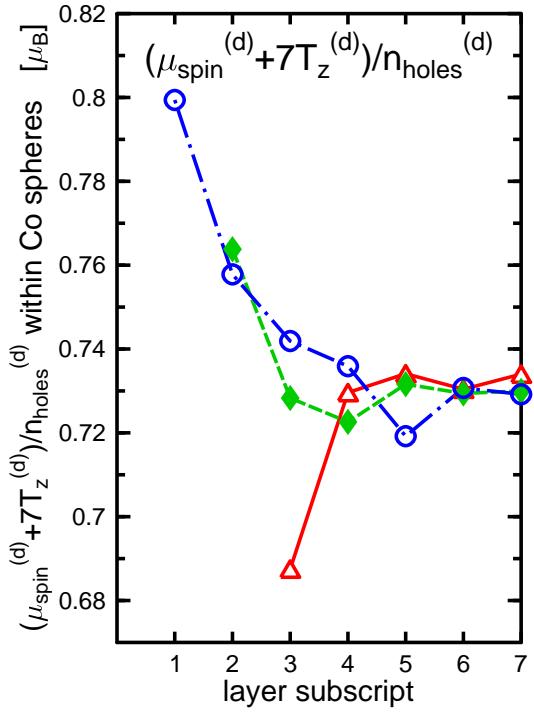
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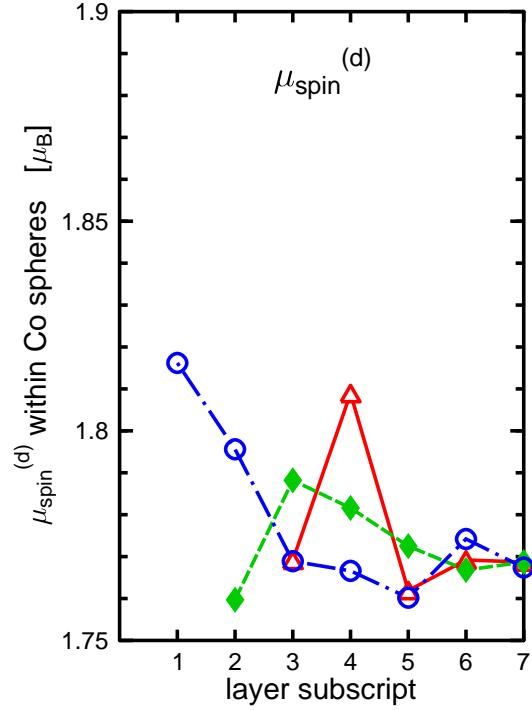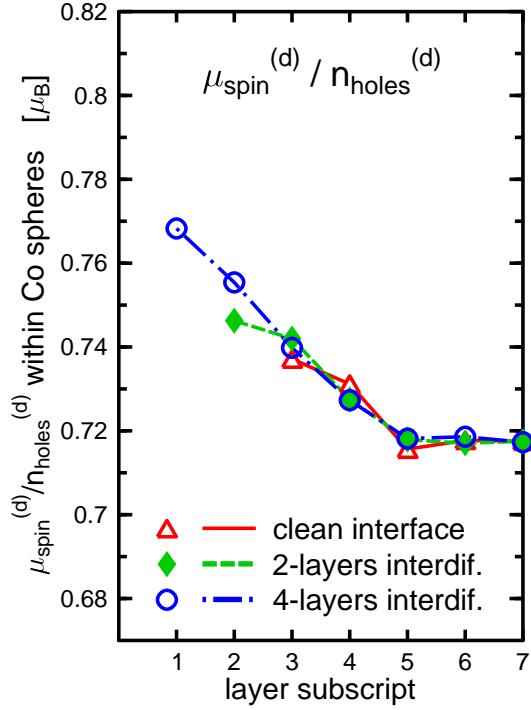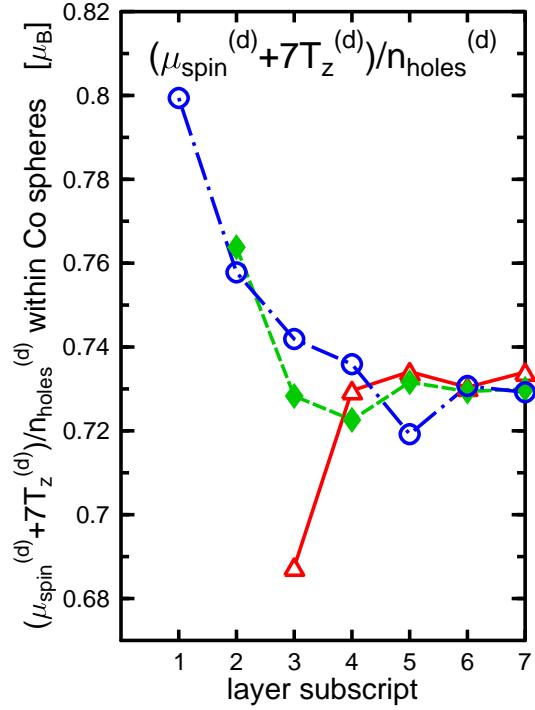
Variations of $n_{holes}^{(d)}$ and $T_z^{(d)}$ matter quite a lot ...

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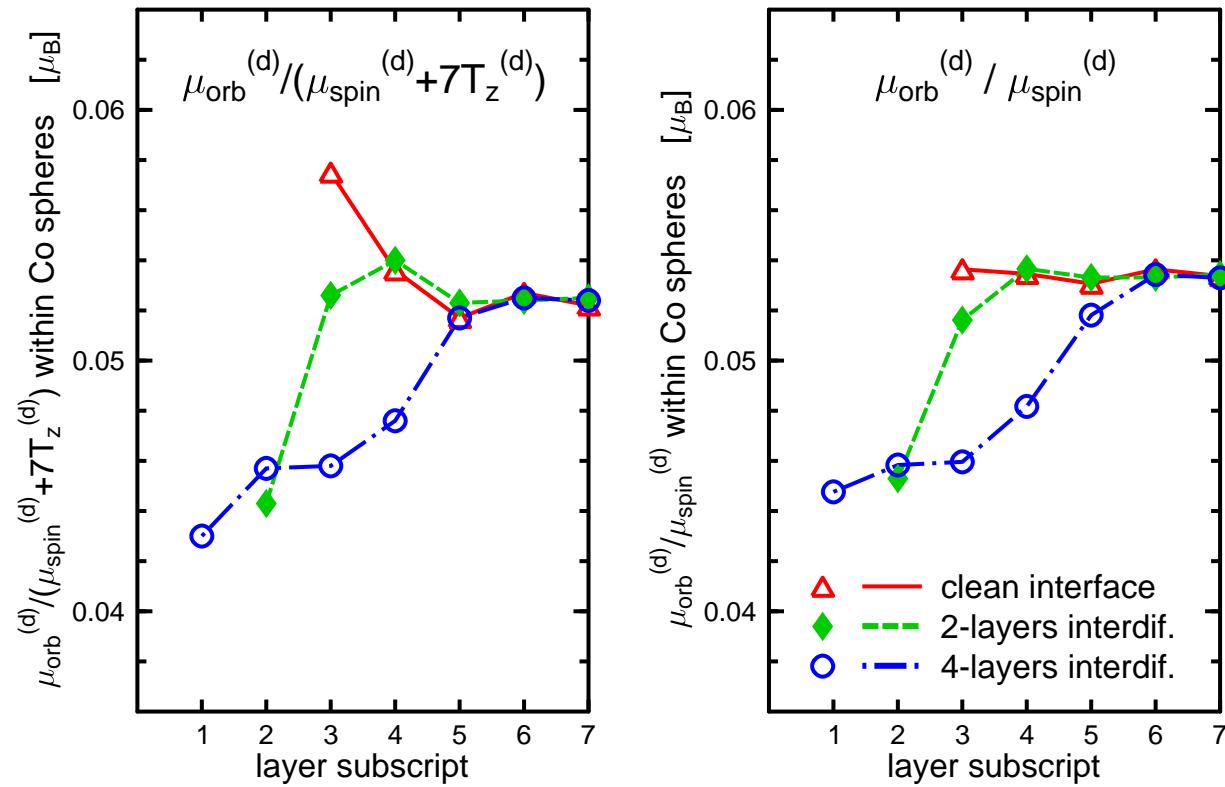
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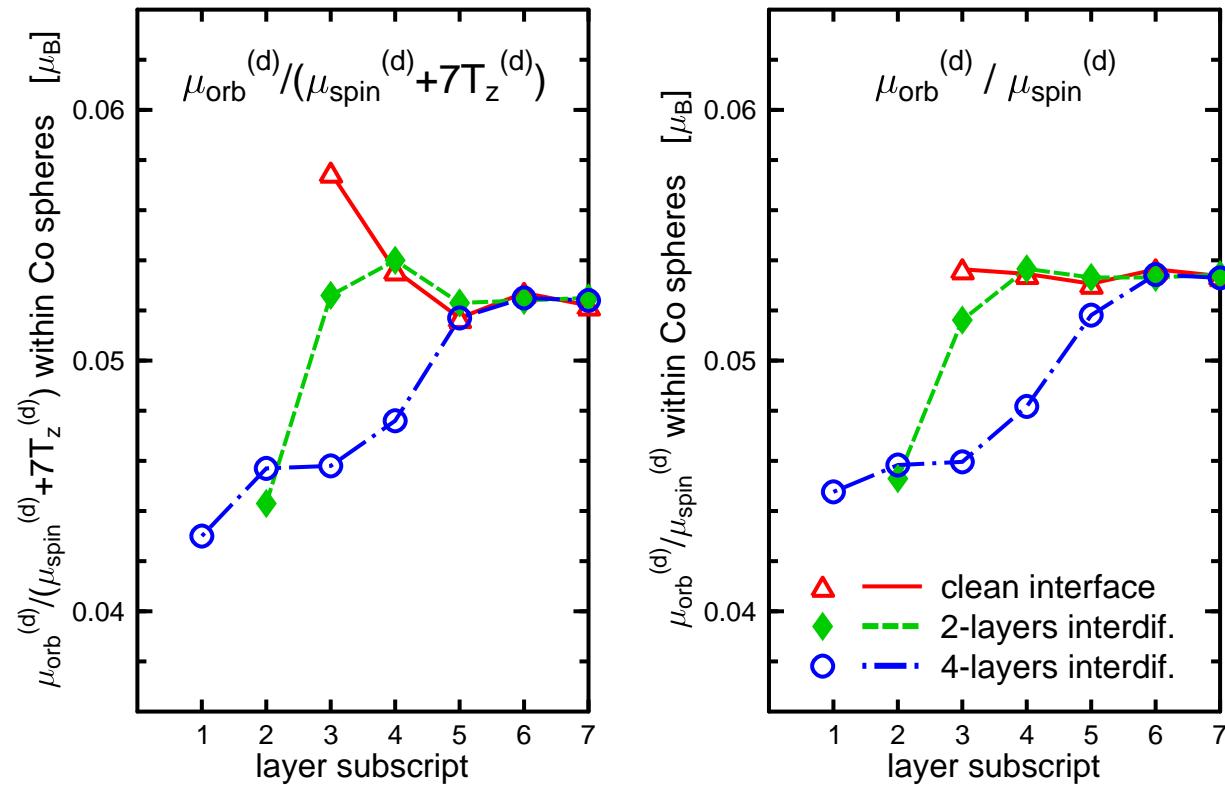
$T_z^{(d)}$ contributes but not drastically

Dependence on coordination no.: Au

- $\mu_{spin}^{(p)}$, $\mu_{spin}^{(d)}$, and $\mu_{orb}^{(d)}$ at Au sites as function of the number of neighboring Co atoms

Magnetic moments of Au atoms in Au_4Co_{11} multilayer
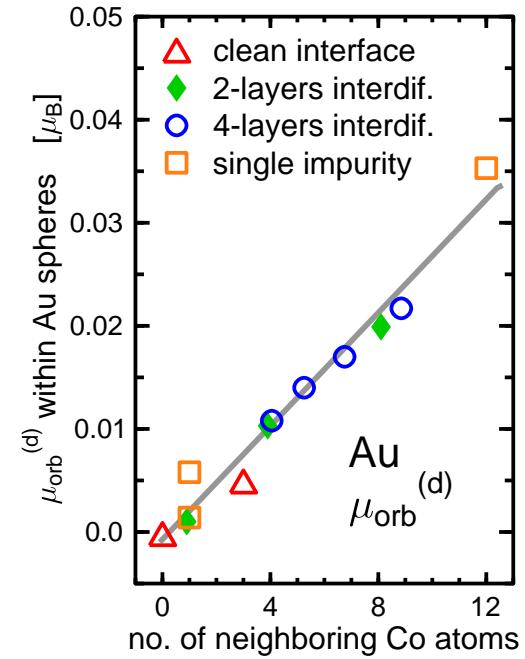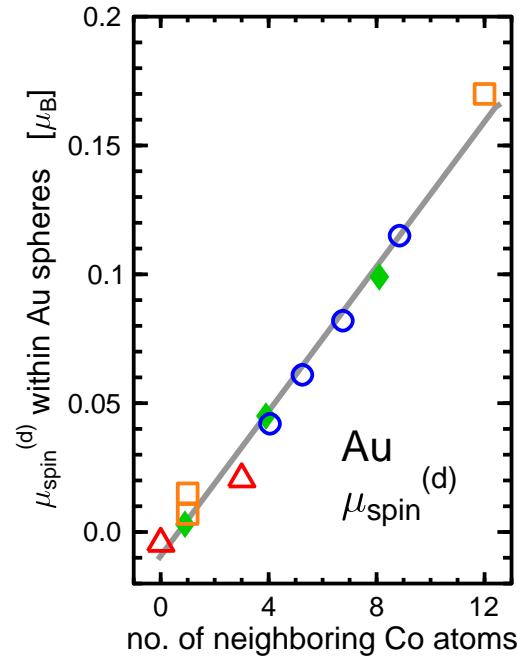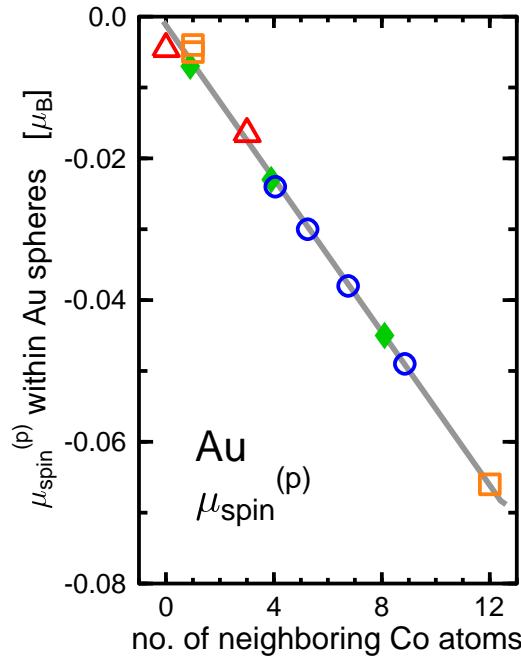
Dependence on coordination no.: Co

- Differences between the true Au_4Co_{11} multilayer and the auxiliary Co_4Co_{11} model system: $\Delta\mu_{spin}^{(p)}$, $\Delta\mu_{spin}^{(d)}$, and $\Delta\mu_{orb}^{(d)}$ at Co sites as function of the number of neighboring Au atoms

Difference of magnetic moments of Co atoms in Au_4Co_{11} multilayer and in a Co_4Co_{11} model system
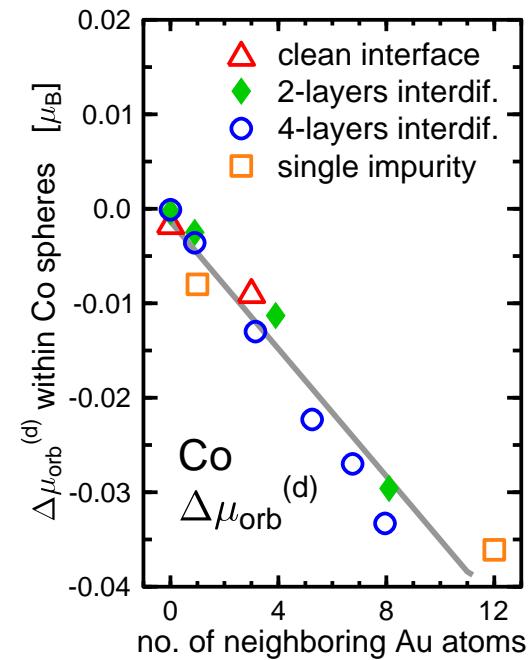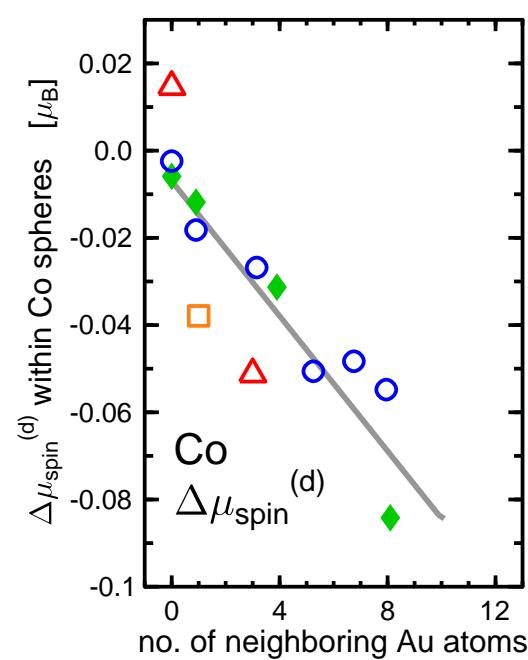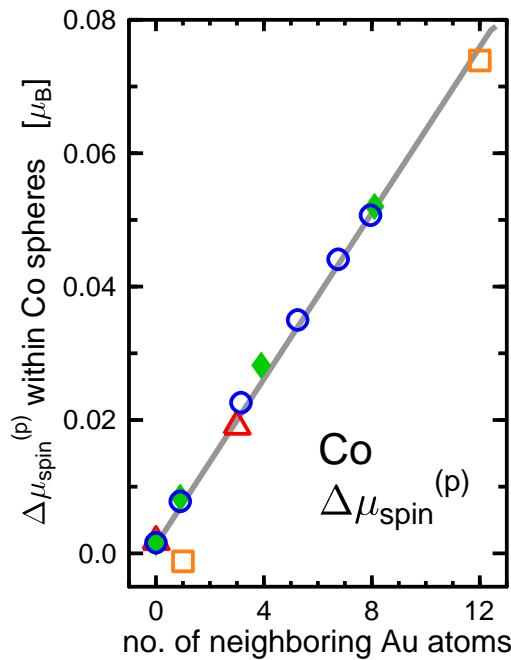
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