SUPPORTING INFORMATION

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Synthesis, Magnetic and NMR spectroscopic properties of the *M*Al_5Pt_3 series (*M* = Ca, Y, La-Nd, Sm-Er)

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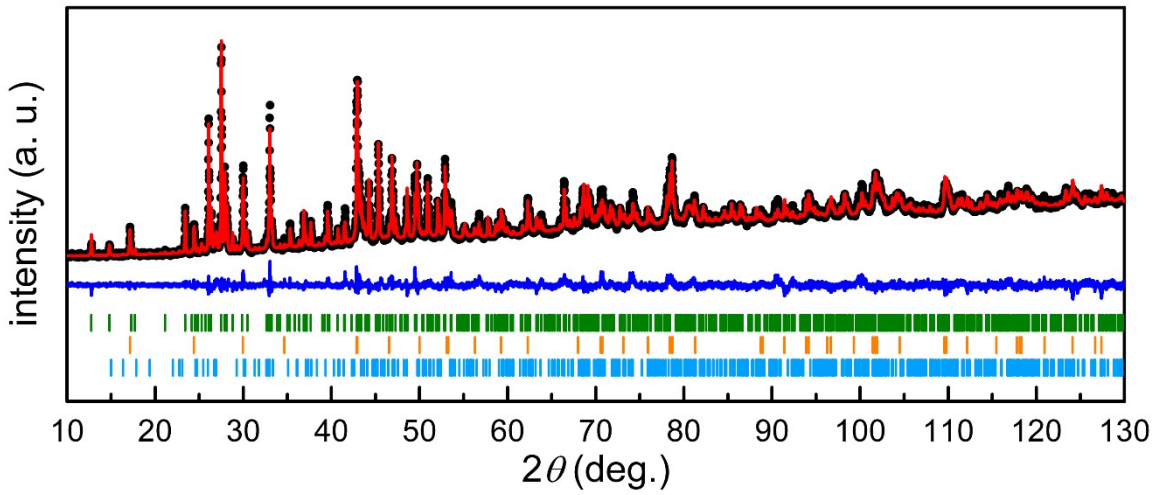

Figure S1. Rietveld fit of the powder X-ray diffraction pattern of $CaAl_5Pt_3$. Experimental data is shown as black dots, the fit as red line, the difference as blue line. The green ticks indicate the Bragg positions for $CaAl_5Pt_3$, the orange ticks the ones of Al_3Pt_2 and the blue ones the of $Ca_2Al_{16}Pt_9$.

Refinement details for the data shown in Figure S1			
Source	Bruker D8 ADVANCE (laboratory X-ray)		
Temperature	RT		
Pressure	ambient		
Wavelengths	Cu $K\alpha_1$ and Cu $K\alpha_2$: 154.0596 and 154.4308 pm		
Chemical formula	$CaAl_5Pt_3$	Al_3Pt_2	$Ca_2Al_{16}Pt_9$
Refined amount / wt.-%	74(1)	15(1)	11(1)
Space group	*Pnma*	$P\bar{3}m1$	*Immm*
a / pm	2050.35(3)	420.75(1)	414.03(5)
b / pm	409.04(1)	420.75(1)	1181.8(2)
c / pm	736.37(1)	517.15(1)	1830.6(3)
V / nm^3	0.6176	0.0783	0.8957
Z	4	1	2
d-space range	0.85-14.35 Å (6-130° 2θ)		
χ^2	2.94		
R_p / %	3.62		
R_{wp} / %	4.82		
Definition of R factors	$R_p = \sum\lvert w\lvert I_0 - I_c\rvert^2\rvert$; $R_{wp} = \left(\frac{\sum\lvert w\lvert I_0 - I_c\rvert^2\rvert}{\sum\lvert wI_0^2\rvert}\right)^{\frac{1}{2}}$		

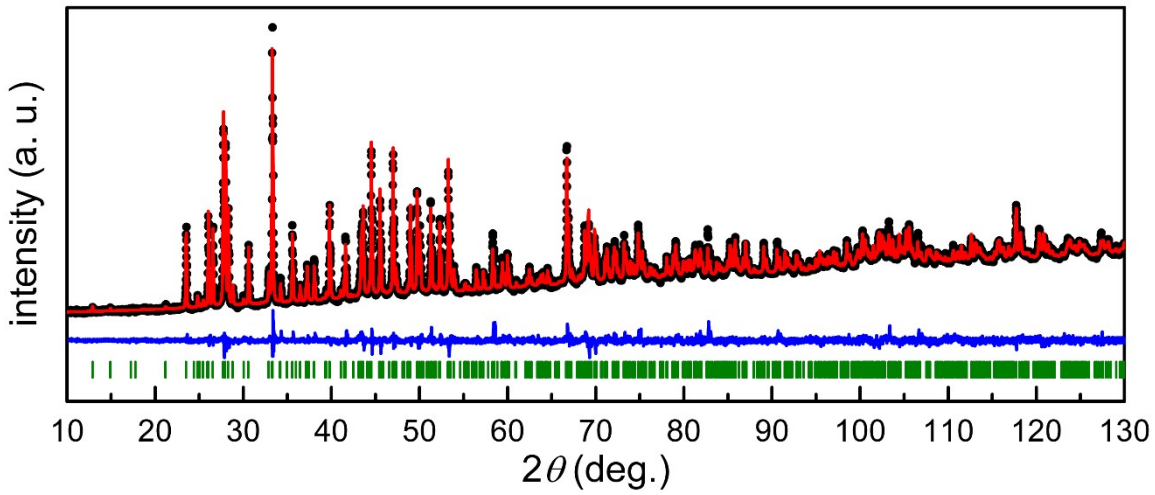

Figure S2. Rietveld fit of the powder X-ray diffraction pattern of YAl_5Pt_3. Experimental data is shown as black dots, the fit as red line, the difference as blue line. The green ticks indicate the Bragg positions for YAl_5Pt_3.

Refinement details for the data shown in Figure S2	
Source	Bruker D8 ADVANCE (laboratory X-ray)
Temperature	RT
Pressure	ambient
Wavelengths	Cu $K\alpha_1$ and Cu $K\alpha_2$: 154.0596 and 154.4308 pm
Chemical formula	YAl_5Pt_3
Refined amount / wt.-%	100
Space group	*Pnma*
a / pm	2052.65(2)
b / pm	406.75(1)
c / pm	728.77(1)
V / nm^3	0.6085
Z	4
d-space range	0.85-14.35 Å (6-130° 2θ)
χ^2	2.83
R_p / %	3.19
R_{wp} / %	4.24
Definition of R factors	$R_p = \sum\lvert w\lvert I_0 - I_c\rvert^2\rvert$; $R_{wp} = \left(\frac{\sum\lvert w\lvert I_0 - I_c\rvert^2\rvert}{\sum\lvert wI_0^2\rvert}\right)^{\frac{1}{2}}$

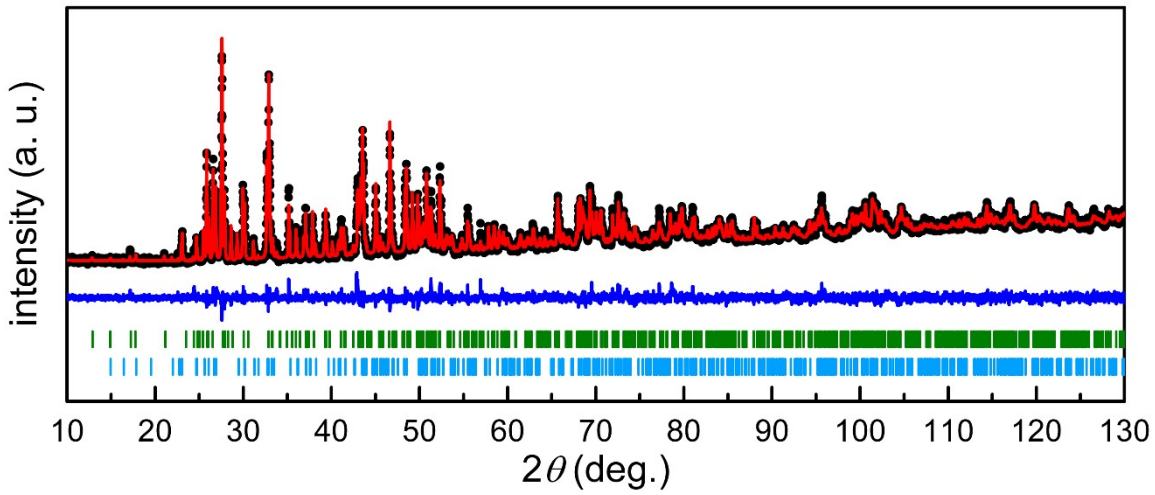

Figure S3. Rietveld fit of the powder X-ray diffraction pattern of $LaAl_5Pt_3$. Experimental data is shown as black dots, the fit as red line, the difference as blue line. The green ticks indicate the Bragg positions for $LaAl_5Pt_3$, the blue ones the of $La_2Al_{16}Pt_9$.

Refinement details for the data shown in Figure S3		
Source	Bruker D8 ADVANCE (laboratory X-ray)	
Temperature	RT	
Pressure	ambient	
Wavelengths	Cu $K\alpha_1$ and Cu $K\alpha_2$: 154.0596 and 154.4308 pm	
Chemical formula	$LaAl_5Pt_3$	$La_2Al_{16}Pt_9$
Refined amount / wt.-%	68(1)	32(1)
Space group	*Pnma*	*Immm*
a / pm	2068.53(2)	416.97(1)
b / pm	415.48(1)	1187.41(3)
c / pm	732.09(1)	1828.34(4)
V / nm^3	0.6292	0.9052
Z	4	2
d-space range	0.85-14.35 Å (6-130° 2θ)	
χ^2	1.90	
R_p / %	4.00	
R_{wp} / %	5.28	
Definition of R factors	$R_p = \sum\lvert w\lvert I_0 - I_c\rvert^2\rvert$; $R_{wp} = \left(\frac{\sum\lvert w\lvert I_0 - I_c\rvert^2\rvert}{\sum\lvert wI_0^2\rvert}\right)^{\frac{1}{2}}$	

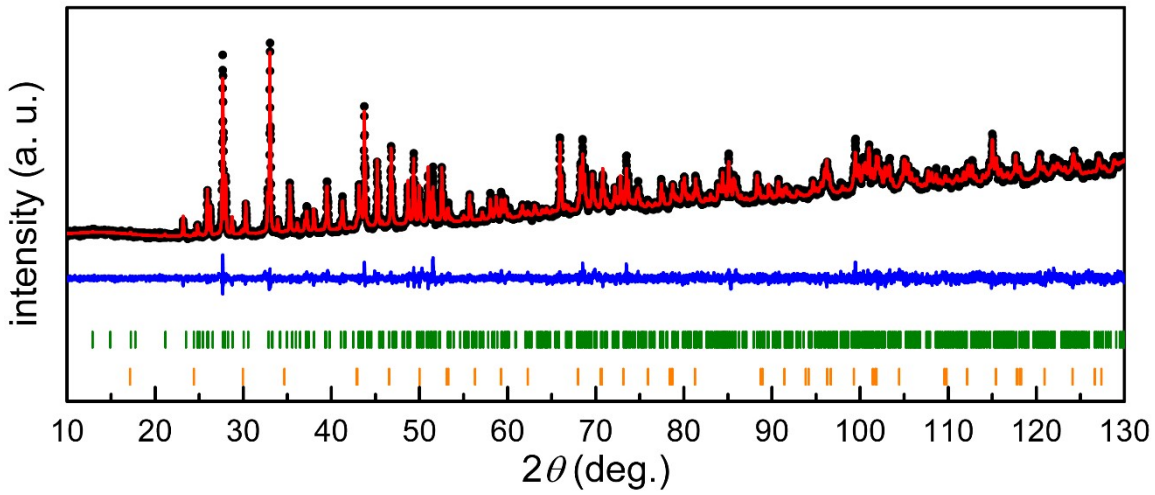

Figure S4. Rietveld fit of the powder X-ray diffraction pattern of $CeAl_5Pt_3$. Experimental data is shown as black dots, the fit as red line, the difference as blue line. The green ticks indicate the Bragg positions for $CeAl_5Pt_3$, the orange ticks the ones of Al_3Pt_2.

Refinement details for the data shown in Figure S4		
Source	Bruker D8 ADVANCE (laboratory X-ray)	
Temperature	RT	
Pressure	ambient	
Wavelengths	Cu $K\alpha_1$ and Cu $K\alpha_2$: 154.0596 and 154.4308 pm	
Chemical formula	$CeAl_5Pt_3$	Al_3Pt_2
Refined amount / wt.-%	98(1)	2(1)
Space group	*Pnma*	$P\bar{3}m1$
a / pm	2063.91(2)	421.43(10)
b / pm	414.01(1)	421.43(10)
c / pm	730.12(1)	517.4(2)
V / nm^3	0.6239	0.0796
Z	4	1
d-space range	0.85-14.35 Å (6-130° 2θ)	
χ^2	1.58	
R_p / %	3.31	
R_{wp} / %	4.38	
Definition of *R* factors	$R_p = \sum\lvert w\lvert I_0 - I_c\rvert^2\rvert$; $R_{wp} = \left(\frac{\sum\lvert w\lvert I_0 - I_c\rvert^2\rvert}{\sum\lvert wI_0^2\rvert}\right)^{\frac{1}{2}}$	

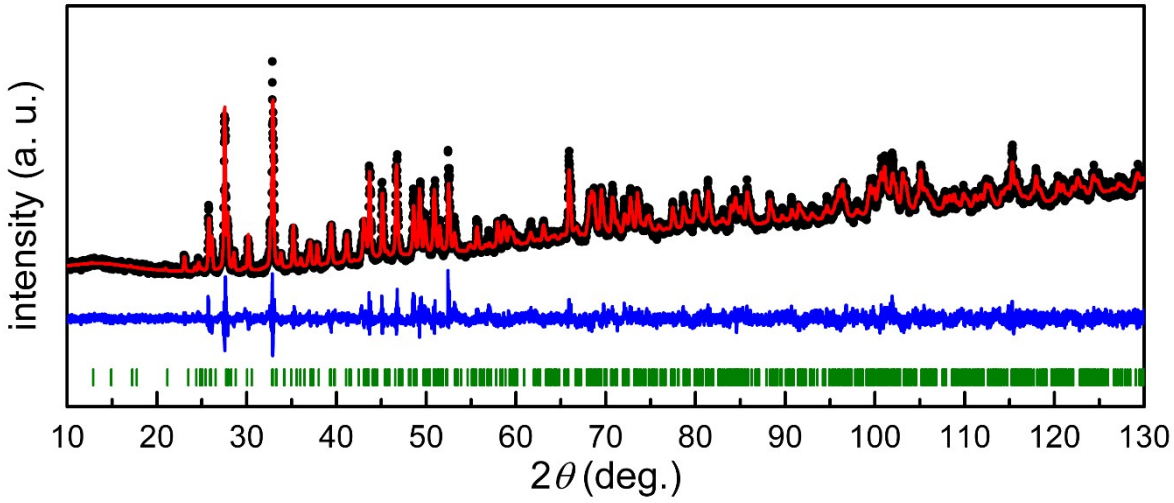

Figure S5. Rietveld fit of the powder X-ray diffraction pattern of $PrAl_5Pt_3$. Experimental data is shown as black dots, the fit as red line, the difference as blue line. The green ticks indicate the Bragg positions for $PrAl_5Pt_3$.

Refinement details for the data shown in Figure S5	
Source	Bruker D8 ADVANCE (laboratory X-ray)
Temperature	RT
Pressure	ambient
Wavelengths	Cu $K\alpha_1$ and Cu $K\alpha_2$: 154.0596 and 154.4308 pm
Chemical formula	$PrAl_5Pt_3$
Refined amount / wt.-%	100
Space group	*Pnma*
a / pm	2061.43(7)
b / pm	412.97(1)
c / pm	729.64(2)
V / nm^3	0.6212
Z	4
d-space range	0.85-14.35 Å (6-130° 2θ)
χ^2	2.26
R_p / %	4.14
R_{wp} / %	5.53
Definition of R factors	$R_p = \sum\lvert w\lvert I_0 - I_c\rvert^2\rvert$; $R_{wp} = \left(\frac{\sum\lvert w\lvert I_0 - I_c\rvert^2\rvert}{\sum\lvert wI_0^2\rvert}\right)^{\frac{1}{2}}$

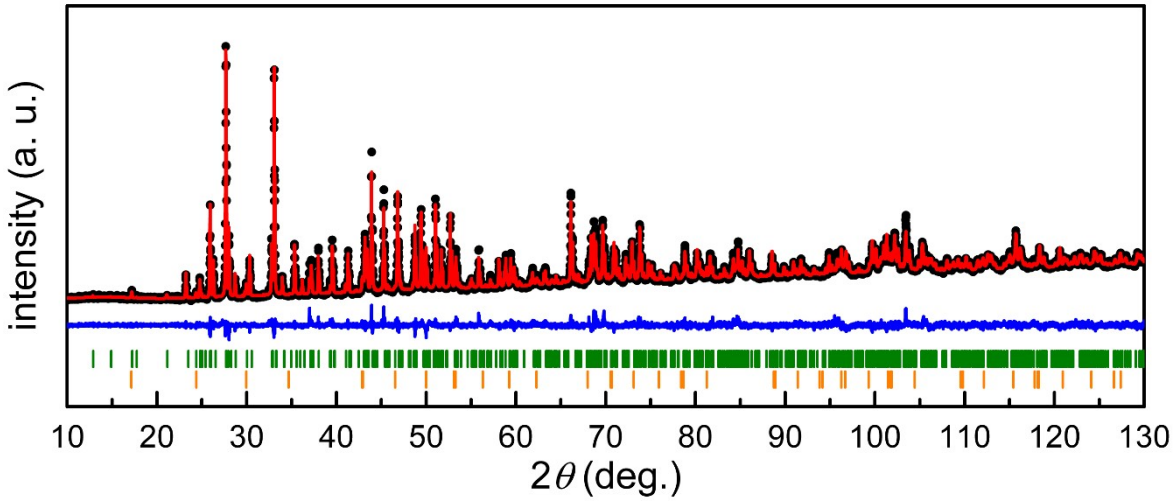

Figure S6. Rietveld fit of the powder X-ray diffraction pattern of $NdAl_5Pt_3$. Experimental data is shown as black dots, the fit as red line, the difference as blue line. The green ticks indicate the Bragg positions for $NdAl_5Pt_3$, the orange ticks the ones of Al_3Pt_2.

Refinement details for the data shown in Figure S6		
Source	Bruker D8 ADVANCE (laboratory X-ray)	
Temperature	RT	
Pressure	ambient	
Wavelengths	Cu $K\alpha_1$ and Cu $K\alpha_2$: 154.0596 and 154.4308 pm	
Chemical formula	$NdAl_5Pt_3$	Al_3Pt_2
Refined amount / wt.-%	97(1)	3(1)
Space group	*Pnma*	$P\bar{3}m1$
a / pm	2059.92(1)	421.56(3)
b / pm	412.05(1)	421.56(3)
c / pm	729.26(1)	515.12(7)
V / nm^3	0.6190	0.0793
Z	4	1
d-space range	0.85-14.35 Å (6-130° 2θ)	
χ^2	2.22	
R_p / %	3.49	
R_{wp} / %	4.65	
Definition of *R* factors	$R_p = \sum\lvert w\lvert I_0 - I_c\rvert^2\rvert$; $R_{wp} = \left(\frac{\sum\lvert w\lvert I_0 - I_c\rvert^2\rvert}{\sum\lvert wI_0^2\rvert}\right)^{\frac{1}{2}}$	

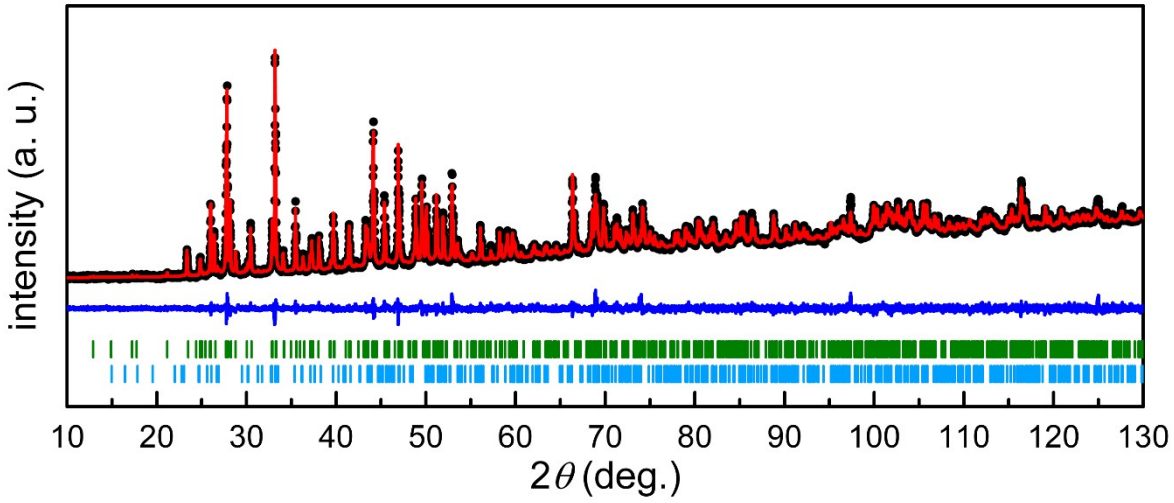

Figure S7. Rietveld fit of the powder X-ray diffraction pattern of $SmAl_5Pt_3$. Experimental data is shown as black dots, the fit as red line, the difference as blue line. The green ticks indicate the Bragg positions for $SmAl_5Pt_3$, the blue ones the of $Sm_2Al_{16}Pt_9$.

Refinement details for the data shown in Figure S7		
Source	Bruker D8 ADVANCE (laboratory X-ray)	
Temperature	RT	
Pressure	ambient	
Wavelengths	Cu $K\alpha_1$ and Cu $K\alpha_2$: 154.0596 and 154.4308 pm	
Chemical formula	$SmAl_5Pt_3$	$Sm_2Al_{16}Pt_9$
Refined amount / wt.-%	95(1)	5(1)
Space group	*Pnma*	*Immm*
a / pm	2057.02(2)	413.95(7)
b / pm	410.24(1)	1184.8(2)
c / pm	728.52(1)	1816.4(4)
V / nm^3	0.6148	0.8909
Z	4	2
d-space range	0.85-14.35 Å (6-130° 2θ)	
χ^2	1.69	
R_p / %	2.89	
R_{wp} / %	3.82	
Definition of R factors	$R_p = \sum\lvert w\lvert I_0 - I_c\rvert^2\rvert$; $R_{wp} = \left(\frac{\sum\lvert w\lvert I_0 - I_c\rvert^2\rvert}{\sum\lvert wI_0^2\rvert}\right)^{\frac{1}{2}}$	

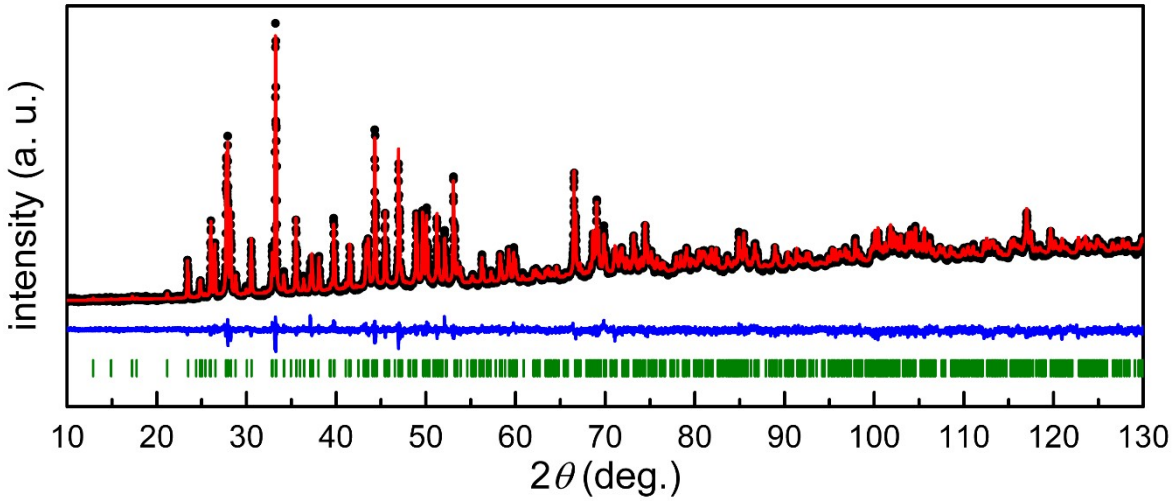

Figure S8. Rietveld fit of the powder X-ray diffraction pattern of $GdAl_5Pt_3$. Experimental data is shown as black dots, the fit as red line, the difference as blue line. The green ticks indicate the Bragg positions for $GdAl_5Pt_3$.

Refinement details for the data shown in Figure S8	
Source	Bruker D8 ADVANCE (laboratory X-ray)
Temperature	RT
Pressure	ambient
Wavelengths	Cu $K\alpha_1$ and Cu $K\alpha_2$: 154.0596 and 154.4308 pm
Chemical formula	$GdAl_5Pt_3$
Refined amount / wt.-%	100
Space group	*Pnma*
a / pm	2054.93(2)
b / pm	408.65(1)
c / pm	728.29(1)
V / nm^3	0.6116
Z	4
d-space range	0.85-14.35 Å (6-130° 2θ)
χ^2	1.75
R_p / %	2.95
R_{wp} / %	3.85
Definition of R factors	$R_p = \sum\lvert w\lvert I_0 - I_c\rvert^2\rvert$; $R_{wp} = \left(\frac{\sum\lvert w\lvert I_0 - I_c\rvert^2\rvert}{\sum\lvert wI_0^2\rvert}\right)^{\frac{1}{2}}$

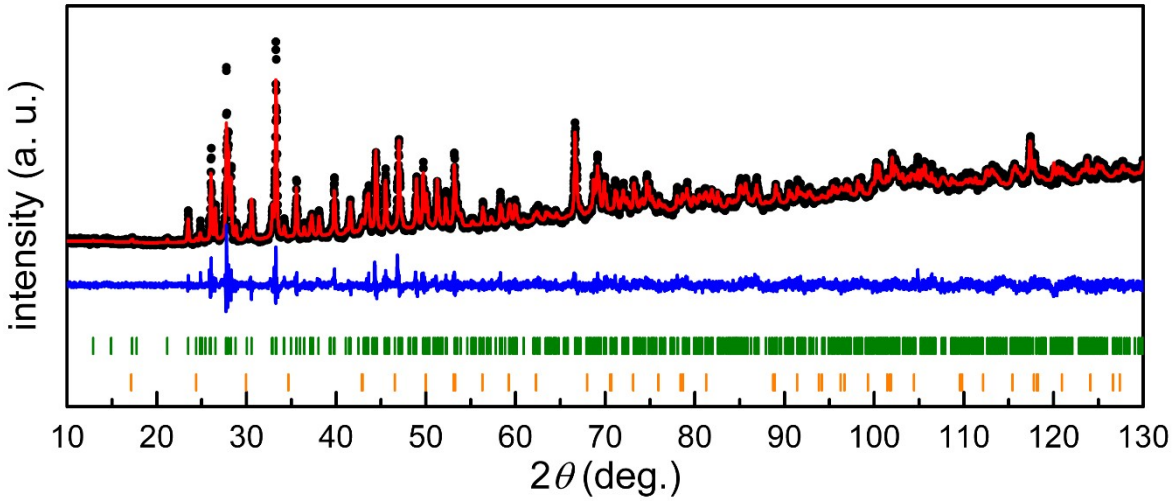

Figure S9. Rietveld fit of the powder X-ray diffraction pattern of $TbAl_5Pt_3$. Experimental data is shown as black dots, the fit as red line, the difference as blue line. The green ticks indicate the Bragg positions for $TbAl_5Pt_3$, the orange ticks the ones of Al_3Pt_2.

Refinement details for the data shown in Figure S9		
Source	Bruker D8 ADVANCE (laboratory X-ray)	
Temperature	RT	
Pressure	ambient	
Wavelengths	Cu $K\alpha_1$ and Cu $K\alpha_2$: 154.0596 and 154.4308 pm	
Chemical formula	$TbAl_5Pt_3$	Al_3Pt_2
Refined amount / wt.-%	96(1)	4(1)
Space group	*Pnma*	$P\bar{3}m1$
a / pm	2053.22(4)	421.3(2)
b / pm	407.67(1)	421.3(2)
c / pm	728.28(2)	517.0(5)
V / nm^3	0.6096	0.0795(1)
Z	4	1
d-space range	0.85-14.35 Å (6-130° 2θ)	
χ^2	2.69	
R_p / %	3.93	
R_{wp} / %	5.48	
Definition of *R* factors	$R_p = \sum\lvert w\lvert I_0 - I_c\rvert^2\rvert$; $R_{wp} = \left(\frac{\sum\lvert w\lvert I_0 - I_c\rvert^2\rvert}{\sum\lvert wI_0^2\rvert}\right)^{\frac{1}{2}}$	

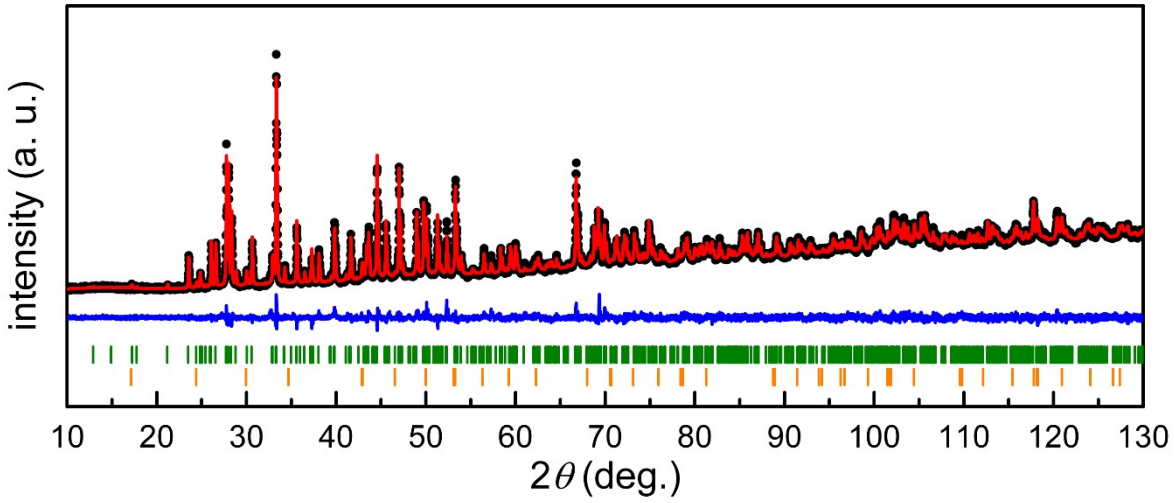

Figure S10. Rietveld fit of the powder X-ray diffraction pattern of $DyAl_5Pt_3$. Experimental data is shown as black dots, the fit as red line, the difference as blue line. The green ticks indicate the Bragg positions for $DyAl_5Pt_3$, the orange ticks the ones of Al_3Pt_2.

Refinement details for the data shown in Figure S10		
Source	Bruker D8 ADVANCE (laboratory X-ray)	
Temperature	RT	
Pressure	ambient	
Wavelengths	Cu $K\alpha_1$ and Cu $K\alpha_2$: 154.0596 and 154.4308 pm	
Chemical formula	$DyAl_5Pt_3$	Al_3Pt_2
Refined amount / wt.-%	97(1)	3(1)
Space group	*Pnma*	$P\bar{3}m1$
a / pm	2051.95(2)	421.12(3)
b / pm	406.67(1)	421.12(3)
c / pm	728.59(1)	516.96(7)
V / nm^3	0.6079	0.0794
Z	4	1
d-space range	0.85-14.35 Å (6-130° 2θ)	
χ^2	1.92	
R_p / %	3.01	
R_{wp} / %	4.02	
Definition of *R* factors	$R_p = \sum\lvert w\lvert I_0 - I_c\rvert^2\rvert$; $R_{wp} = \left(\frac{\sum\lvert w\lvert I_0 - I_c\rvert^2\rvert}{\sum\lvert wI_0^2\rvert}\right)^{\frac{1}{2}}$	

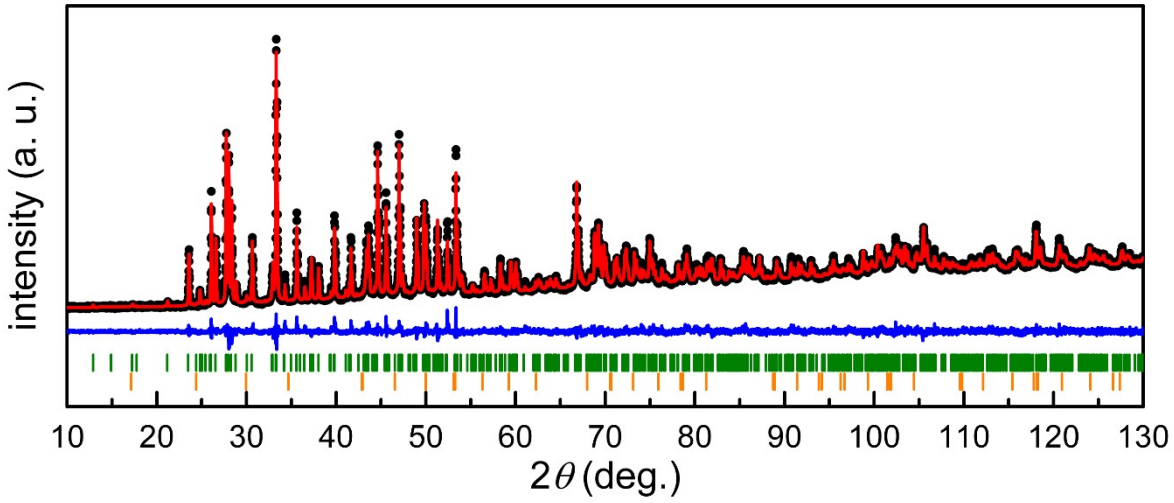

Figure S11. Rietveld fit of the powder X-ray diffraction pattern of $HoAl_5Pt_3$. Experimental data is shown as black dots, the fit as red line, the difference as blue line. The green ticks indicate the Bragg positions for $HoAl_5Pt_3$, the orange ticks the ones of Al_3Pt_2.

Refinement details for the data shown in Figure S11		
Source	Bruker D8 ADVANCE (laboratory X-ray)	
Temperature	RT	
Pressure	ambient	
Wavelengths	Cu $K\alpha_1$ and Cu $K\alpha_2$: 154.0596 and 154.4308 pm	
Chemical formula	$HoAl_5Pt_3$	Al_3Pt_2
Refined amount / wt.-%	99(1)	1(1)
Space group	*Pnma*	$P\bar{3}m1$
a / pm	2050.36(2)	420.6(5)
b / pm	405.89(1)	420.6(5)
c / pm	729.07(1)	510.0(12)
V / nm^3	0.6067	0.0781
Z	4	1
d-space range	0.85-14.35 Å (6-130° 2θ)	
χ^2	2.15	
R_p / %	3.08	
R_{wp} / %	4.09	
Definition of *R* factors	$R_p = \sum\lvert w\lvert I_0 - I_c\rvert^2\rvert$; $R_{wp} = \left(\frac{\sum\lvert w\lvert I_0 - I_c\rvert^2\rvert}{\sum\lvert wI_0^2\rvert}\right)^{\frac{1}{2}}$	

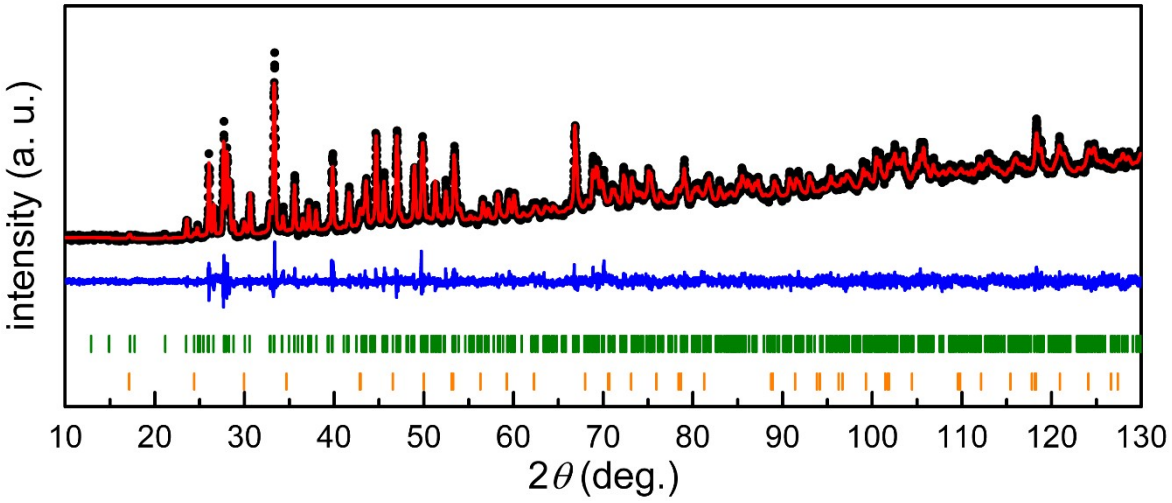

Figure S12. Rietveld fit of the powder X-ray diffraction pattern of $ErAl_5Pt_3$. Experimental data is shown as black dots, the fit as red line, the difference as blue line. The green ticks indicate the Bragg positions for $ErAl_5Pt_3$, the orange ticks the ones of Al_3Pt_2.

Refinement details for the data shown in Figure S12		
Source	Bruker D8 ADVANCE (laboratory X-ray)	
Temperature	RT	
Pressure	ambient	
Wavelengths	Cu $K\alpha_1$ and Cu $K\alpha_2$: 154.0596 and 154.4308 pm	
Chemical formula	$ErAl_5Pt_3$	Al_3Pt_2
Refined amount / wt.-%	96(1)	4(1)
Space group	*Pnma*	$P\bar{3}m1$
a / pm	2049.24(5)	420.86(7)
b / pm	405.11(1)	420.86(7)
c / pm	729.74(2)	517.0(2)
V / nm^3	0.6058	0.0791
Z	4	1
d-space range	0.85-14.35 Å (6-130° 2θ)	
χ^2	2.11	
R_p / %	3.57	
R_{wp} / %	4.78	
Definition of *R* factors	$R_p = \sum\lvert w\lvert I_0 - I_c\rvert^2\rvert$; $R_{wp} = \left(\frac{\sum\lvert w\lvert I_0 - I_c\rvert^2\rvert}{\sum\lvert wI_0^2\rvert}\right)^{\frac{1}{2}}$	