

Etat liquide de spin sans gap dans un composé de Vanadium Kagome quantique

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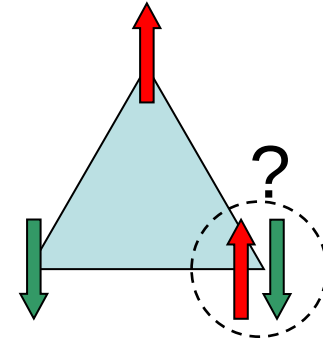
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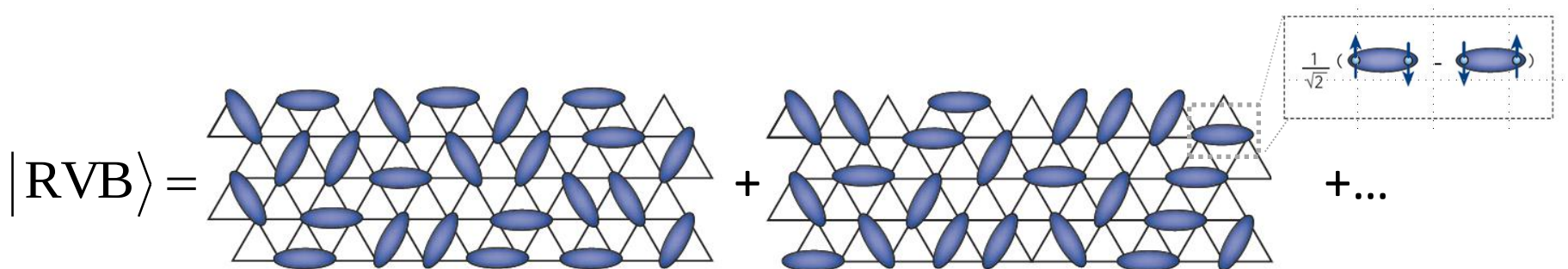
Frustration des interactions

- Frustration :

$$\mathcal{H} = -\frac{1}{2} \sum_{\langle i,j \rangle} J_{i,j} \vec{S}_i \cdot \vec{S}_j$$



- Anderson, 1973, état liquide de spin RVB (Resonating Valence Bond).



Plan

- Présentation du matériau
- Mesures macroscopiques
 - Aimantation
 - Susceptibilité macroscopique
 - Chaleur spécifique
- Mesures locales
 - μ SR

Le composé étudié : Vanadium Oxyfluoré



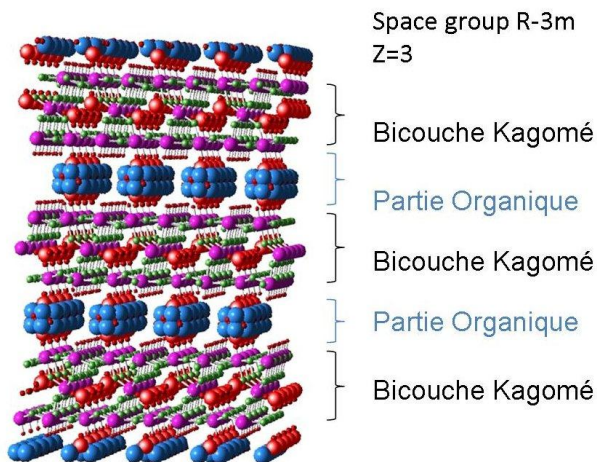
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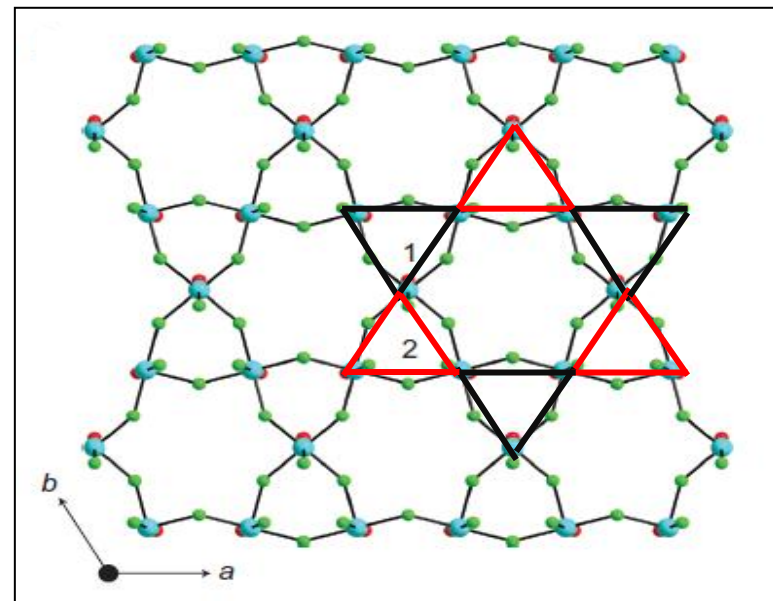
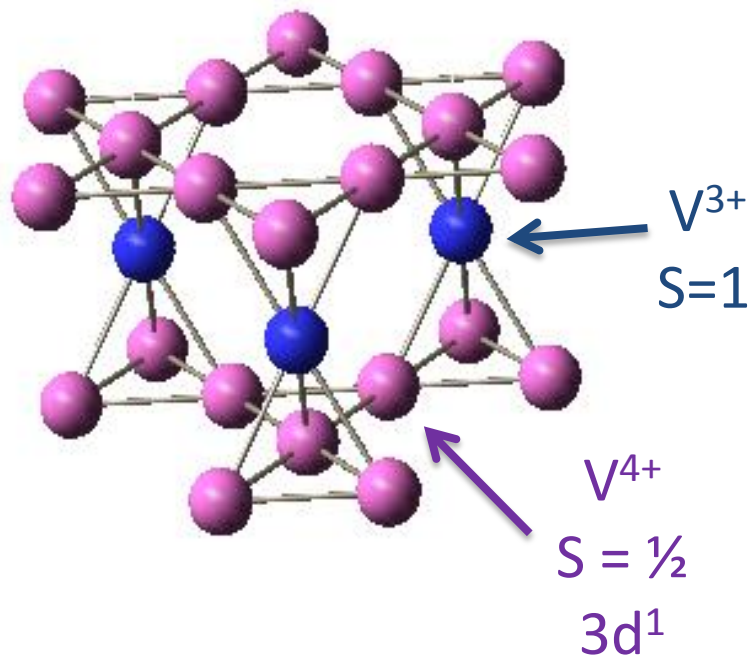
ARTICLES

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An ionothermally prepared $S = 1/2$ vanadium oxyfluoride kagome lattice

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$$V-V = 3.601 \text{ \AA}$$

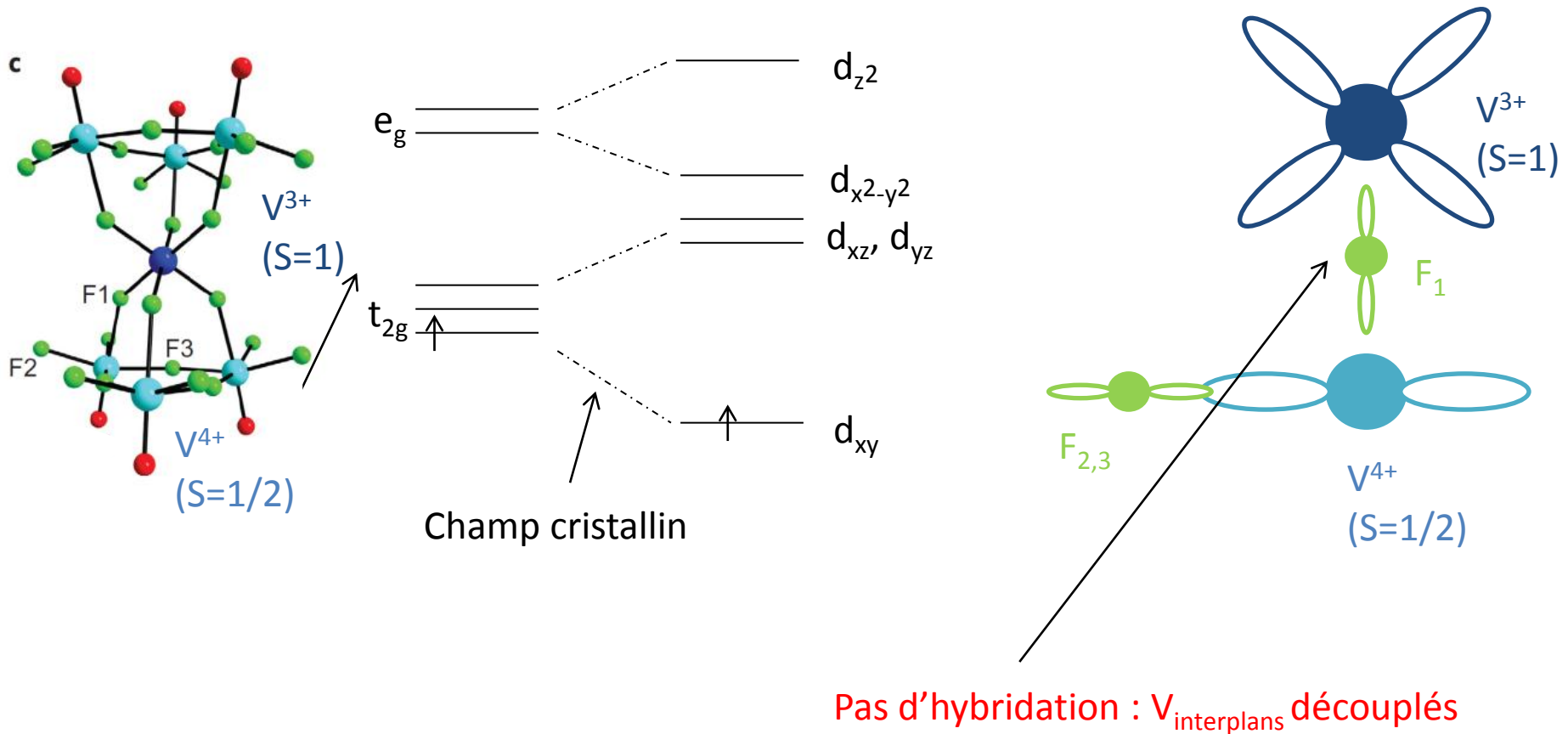
$$V-F-V = 143^\circ$$

$$V-V = 3.753 \text{ \AA}$$

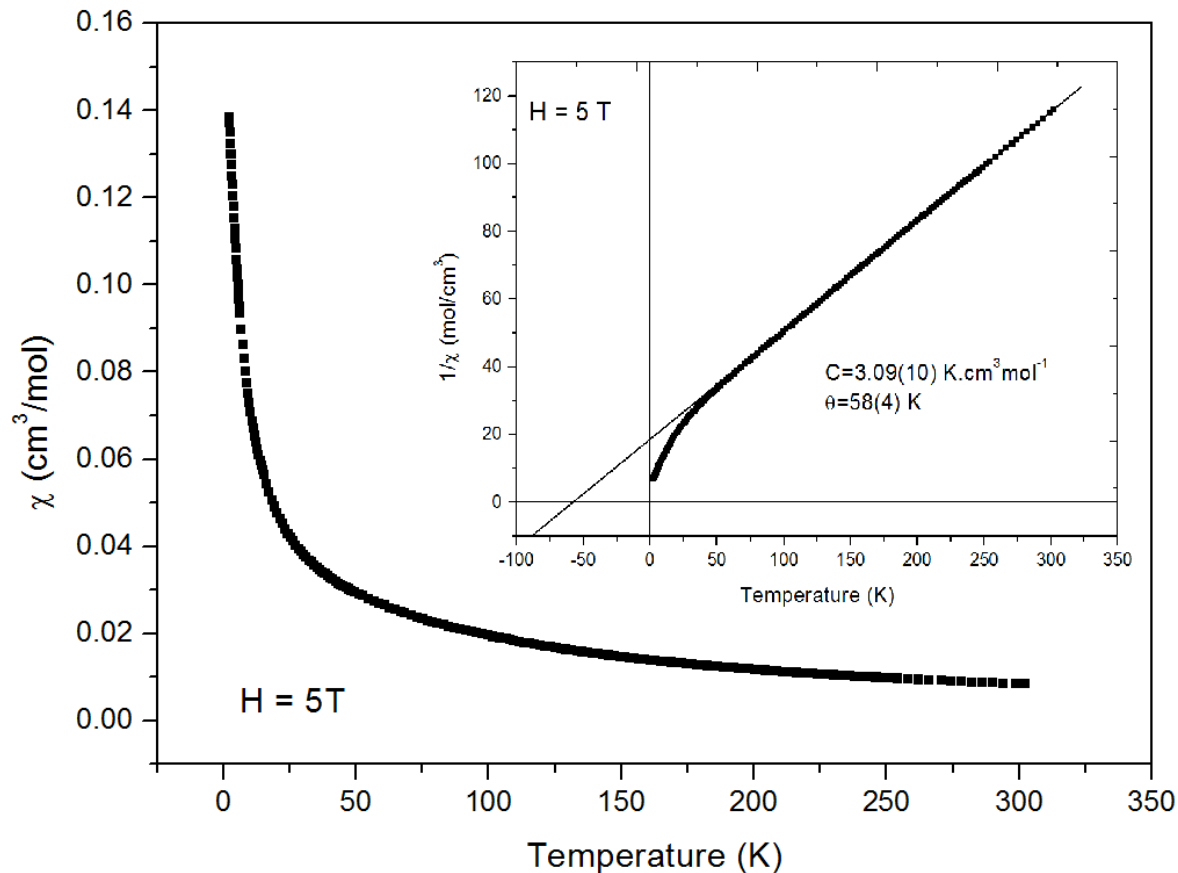
$$V-F-V = 132^\circ$$

- Composé bicouche Kagomé à base de Vanadium

Interactions dans le composé



Susceptibilité macroscopique

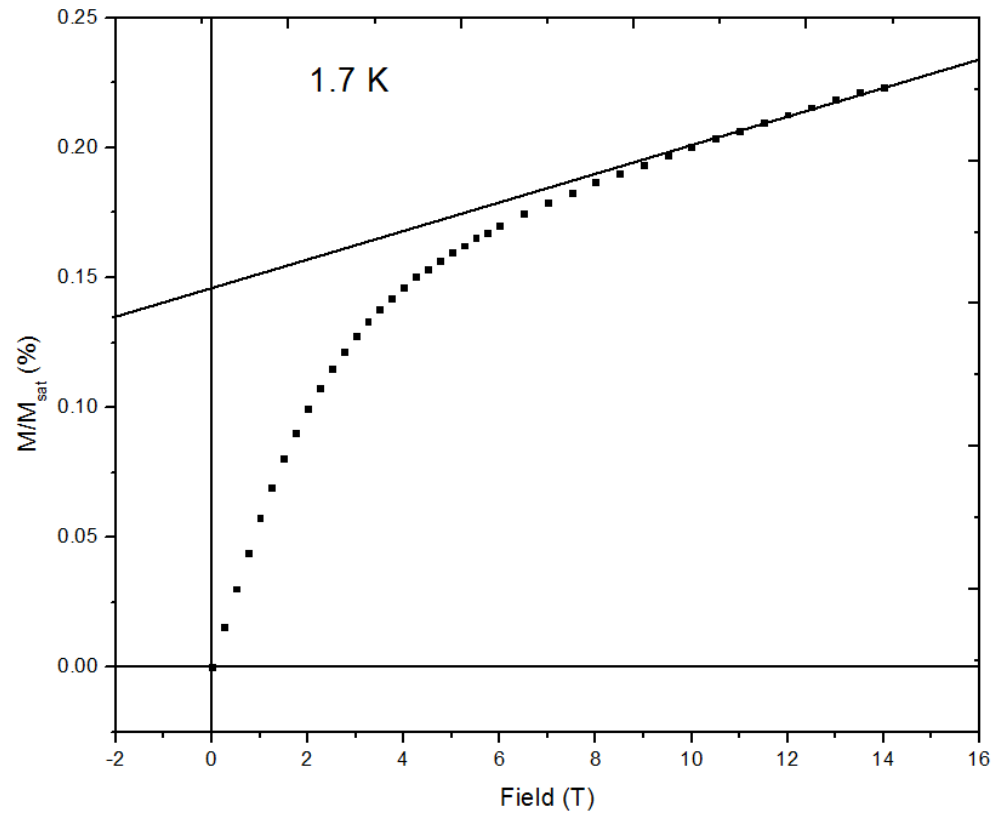


$J=58(4) \text{ K}$

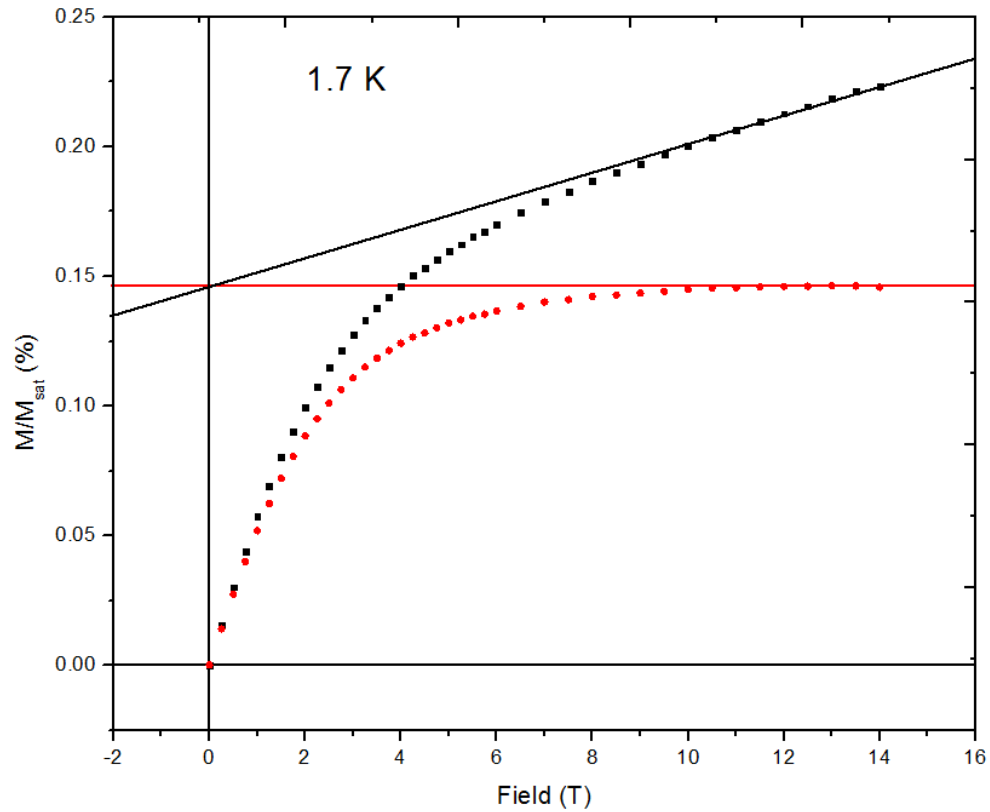
Pas de transitions jusqu'à au moins 2 K malgré une température de Curie de 58 K

Forte Frustration

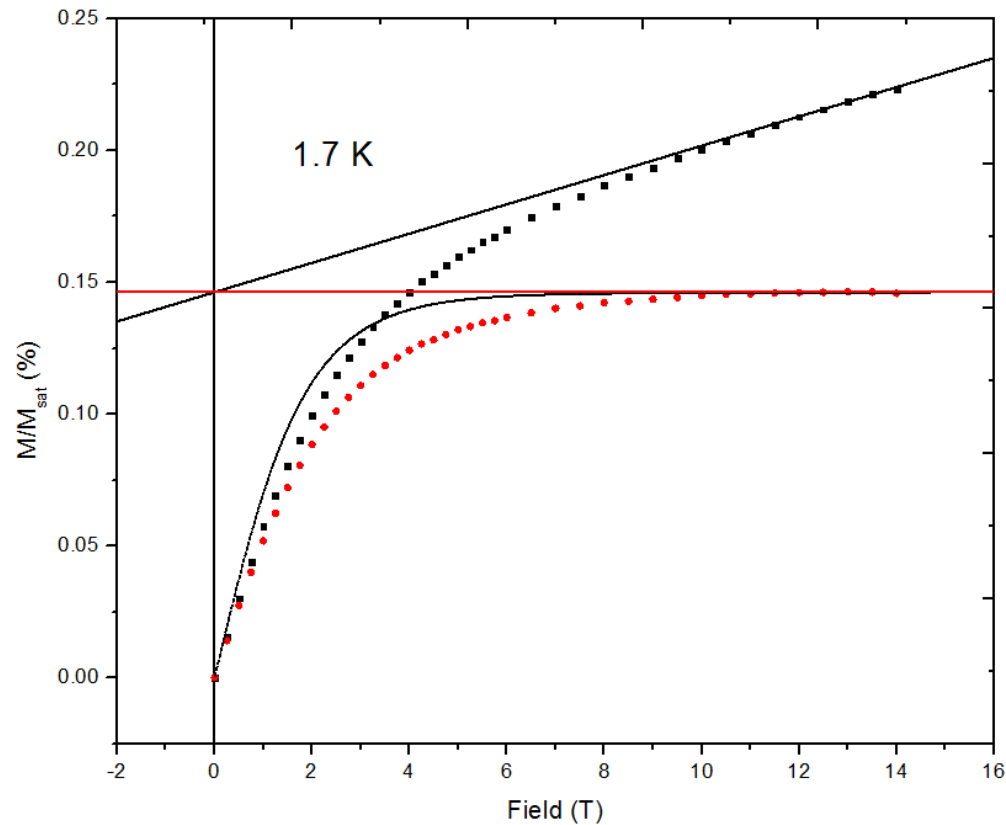
Aimantation



Aimantation



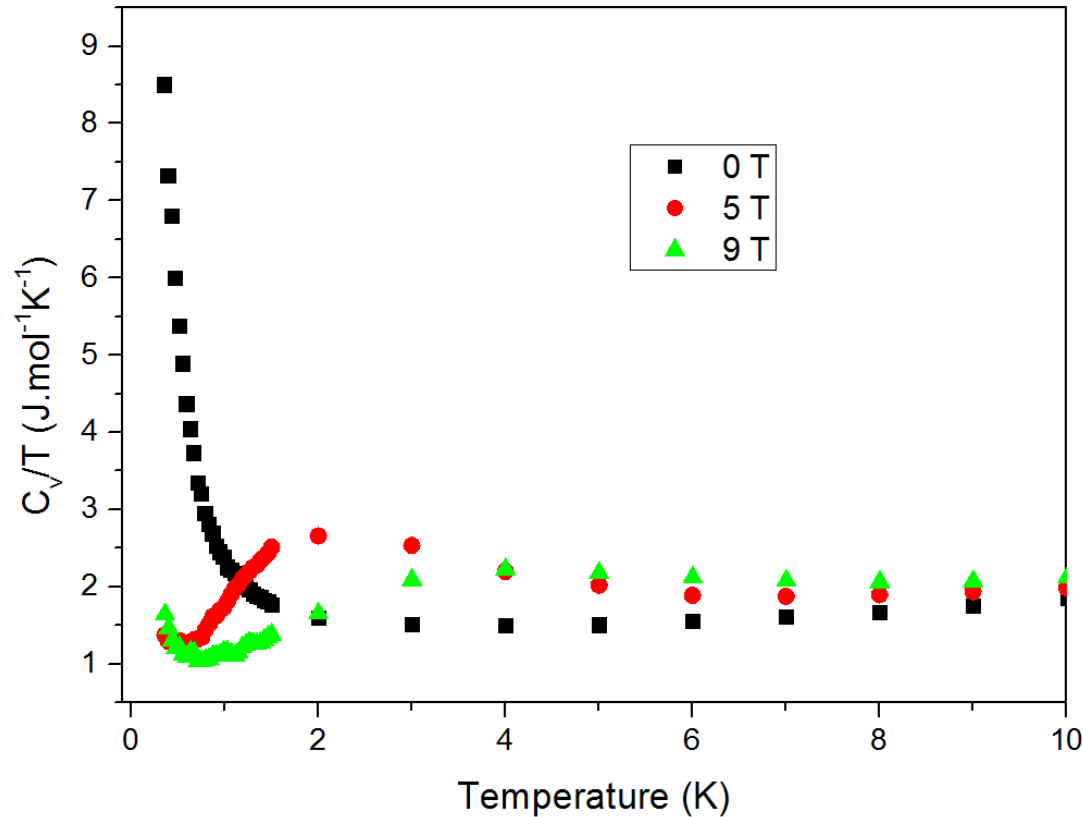
Aimantation



$J_{\text{interplans}} \sim 1\text{K}$

Les Vanadiums V^{3+} ($S=1$) interplans sont quasi libres

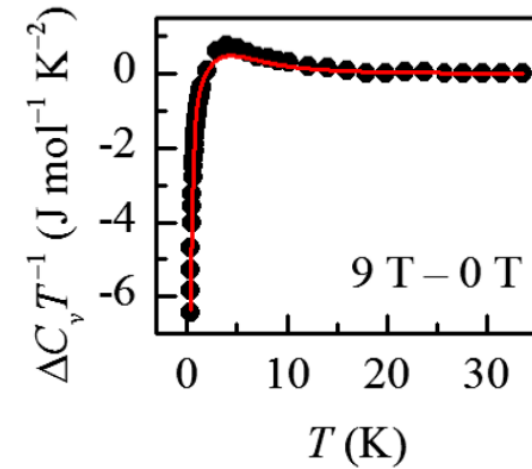
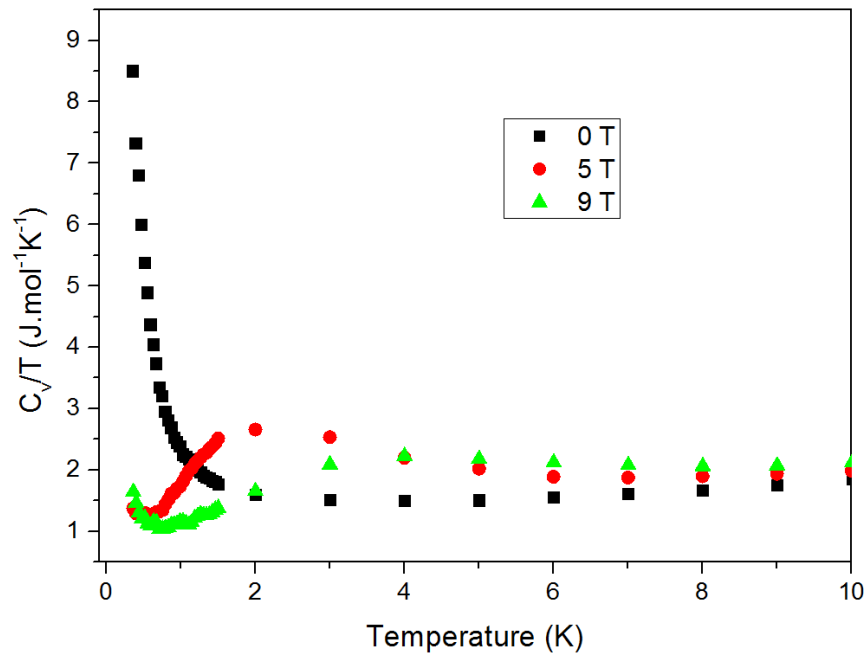
Chaleur Spécifique



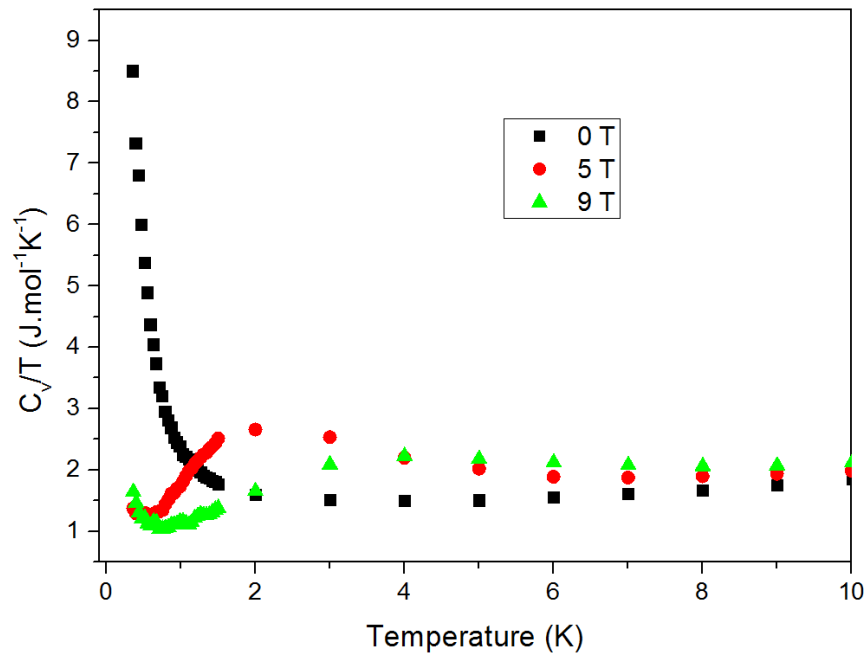
Plusieurs contributions :

- Phonons
- Kagomé (indépendant du champ)
- Schottky électronique V^{3+}
- Schottky nucléaire F et H

Chaleur Spécifique

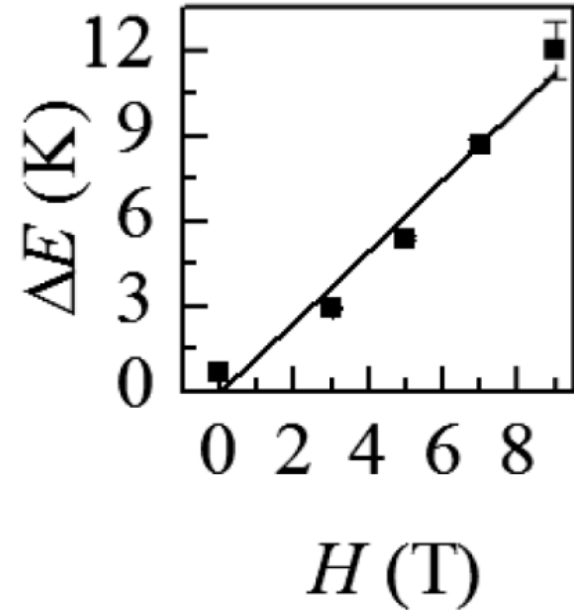
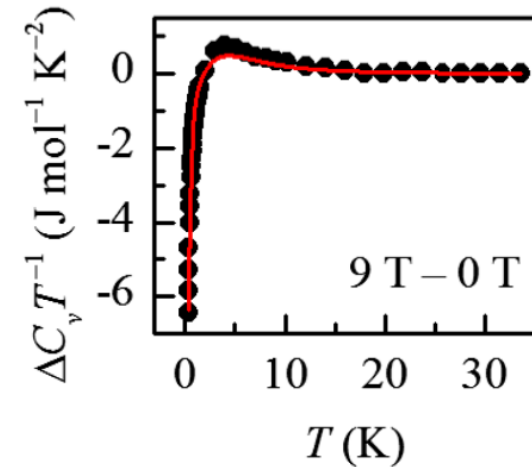


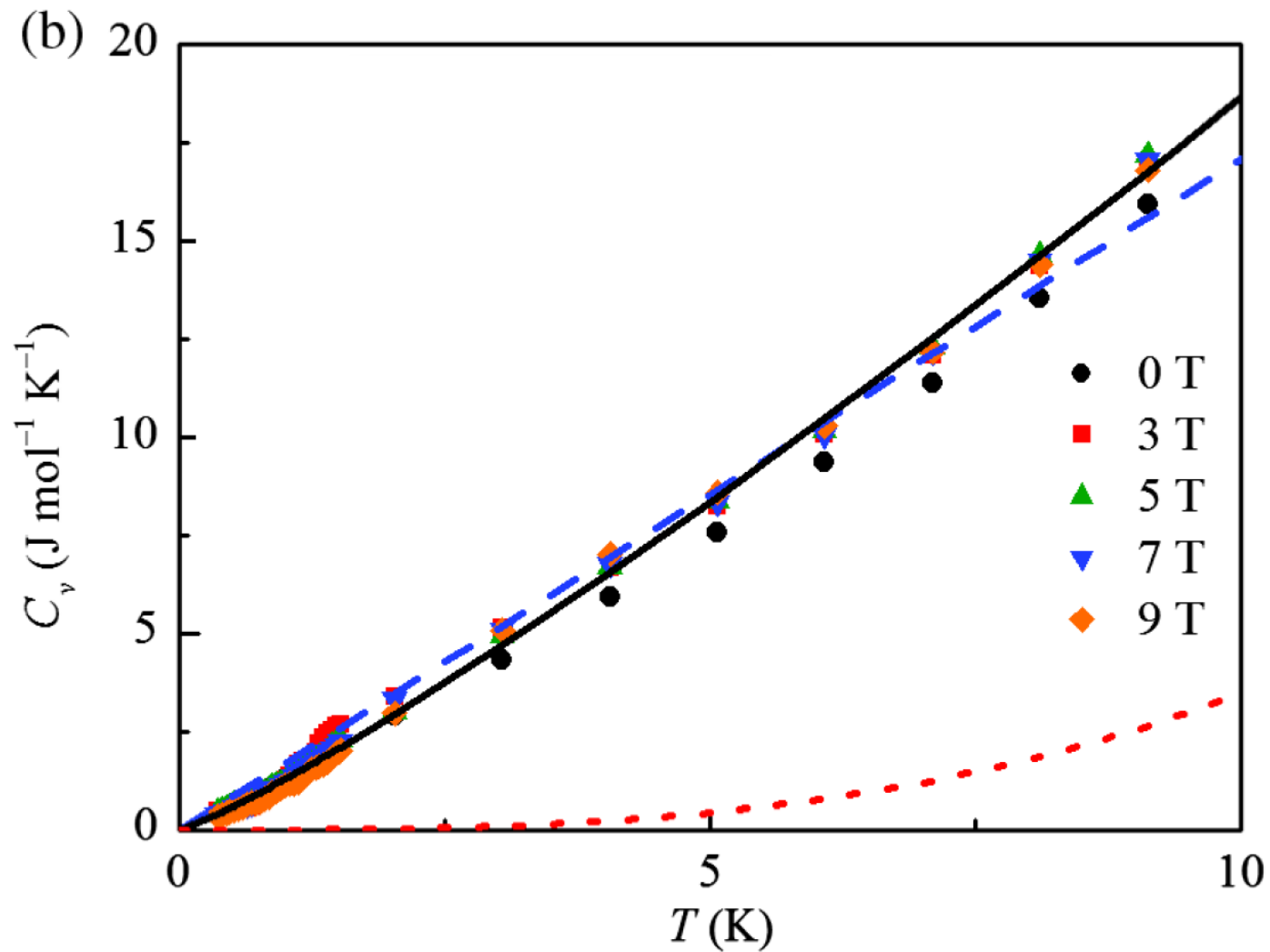
Chaleur Spécifique



$$\Delta E = g\mu_B H$$

$$g \sim 1.8(2)$$





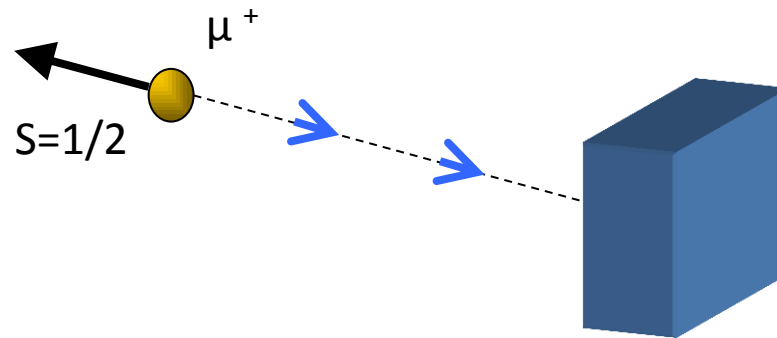
Pas de transitions magnétiques : liquide de spin sans gap
(gap < J/200).

$C_v = T^\alpha$ avec $1 < \alpha < 1.2$: comportement quasi linéaire, métal simple :
description fermionique ?

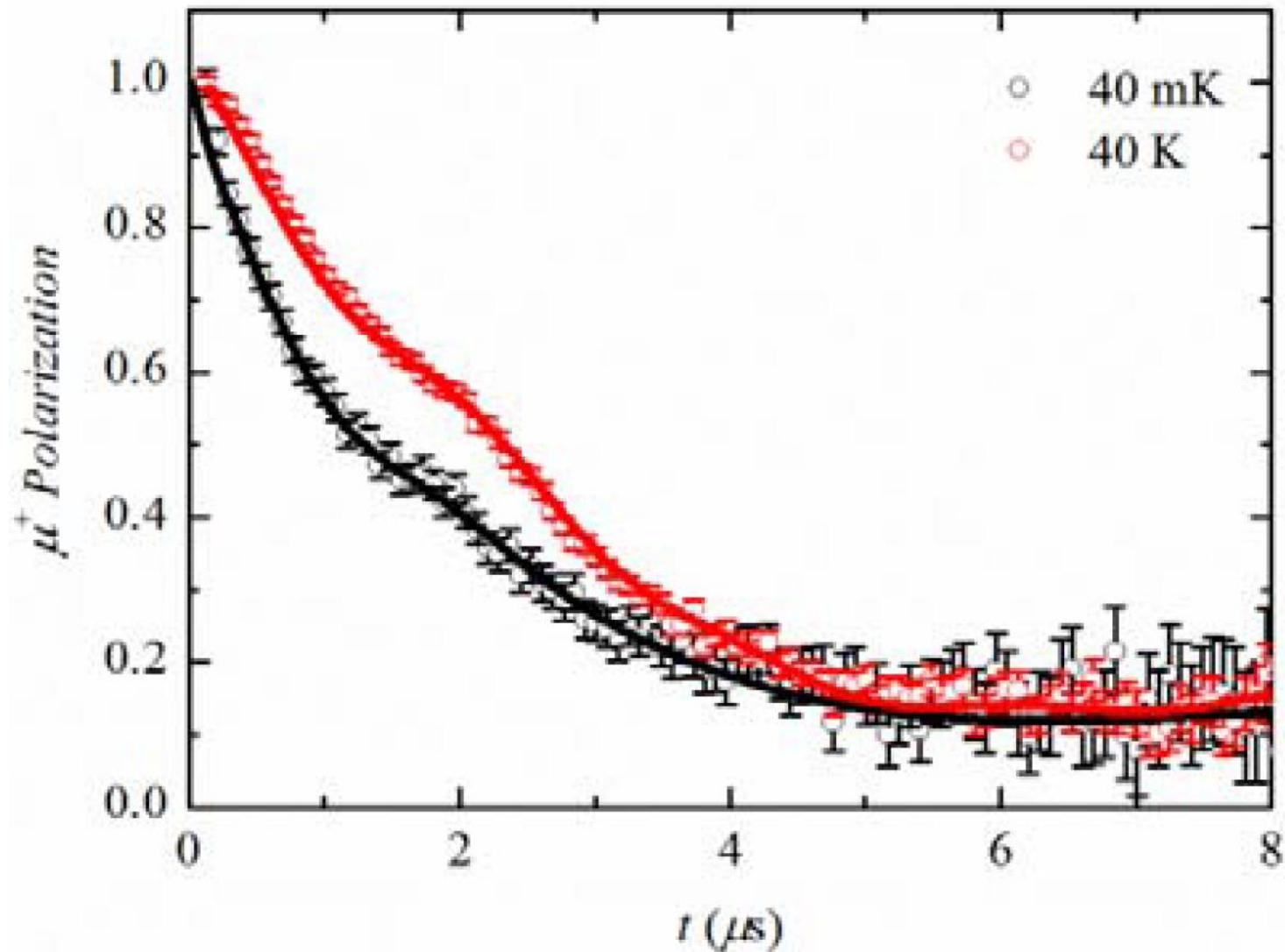
Sonde locale : μ SR

Les muons sont implantés dans le matériau et sondent localement le magnétisme

Très sensible aux faibles champs (10^{-3} - $10^{-4} \mu_B$)



Implantation près des F^- ou O^{2-}



Pas de gel jusqu'à au moins 40 mK : **comportement liquide de spin**