

Estudo da desordem estrutural em óxidos de perovskitas duplas.

Jornada IC – 2019

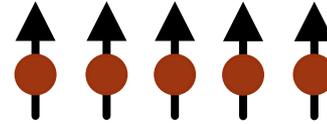
Aluna: Tayane da Silva Portes

Orientação: Elisa Saitovitch e Cynthia Contreras

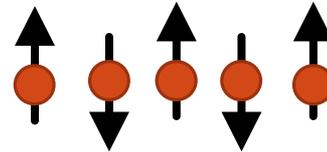
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- **INTRODUÇÃO (QSL EM PEROVSKITAS DUPLAS)**
 - **TRABALHO EXPERIMENTAL**
 - **PREPARAÇÃO DE AMOSTRAS**
 - **DIFRAÇÃO DE RAIO X**
 - **MEDIDAS DE MAGNETIZAÇÃO**
 - **ESPECTROSCOPIA MÖSSBAUER**
 - **CONCLUSÕES**

Ordenamientos magnéticos

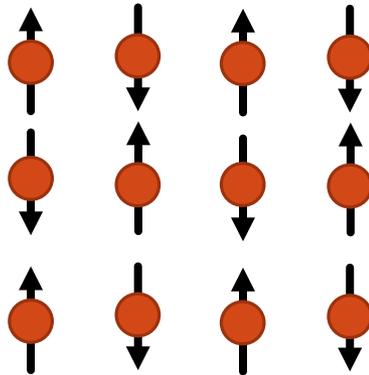
Ferromagnético (FM):



Antiferromagnético (AFM):

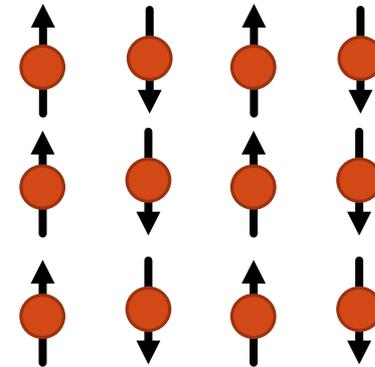


(NAF)



Néel

(CAF)

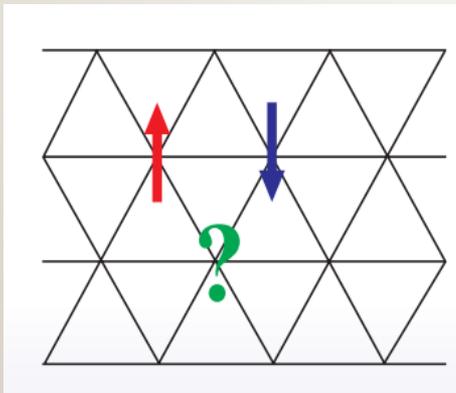


Columnar

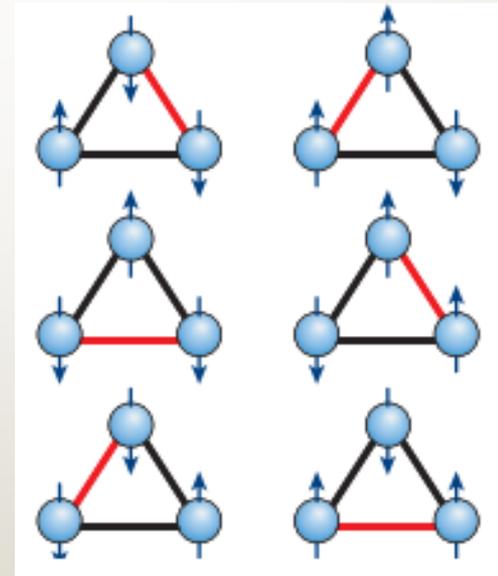
FRUSTRAÇÃO MAGNÉTICA – INTERAÇÕES AFM

COMPETIÇÃO ENTRE AS INTERAÇÕES

Modelo de Ising



- 6 estados fundamentais
- Sem perda de energia

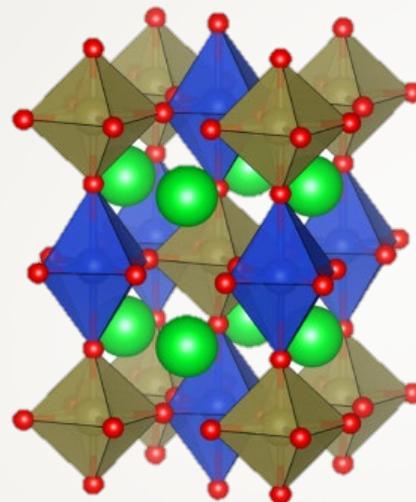


LÍQUIDO DE SPIN QUÂNTICO (QSL)

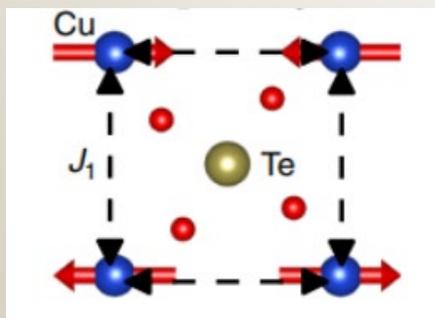
- Estado quântico encontrado experimentalmente recentemente
- Spins flutuam de forma coerente mesmo em baixíssimas temperaturas



Perovskitas duplas de cobre

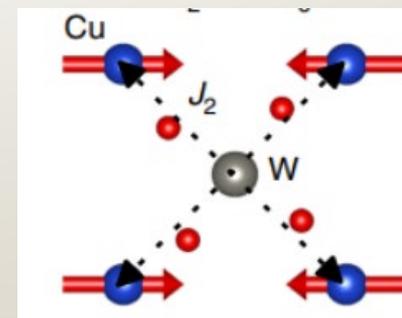
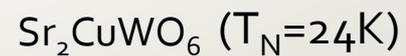


← Redes quadradas de Cu



NAF (J_1)

Interações magnéticas
bidimensionais



CAF (J_2)

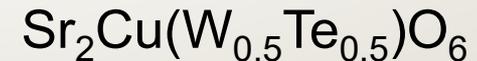
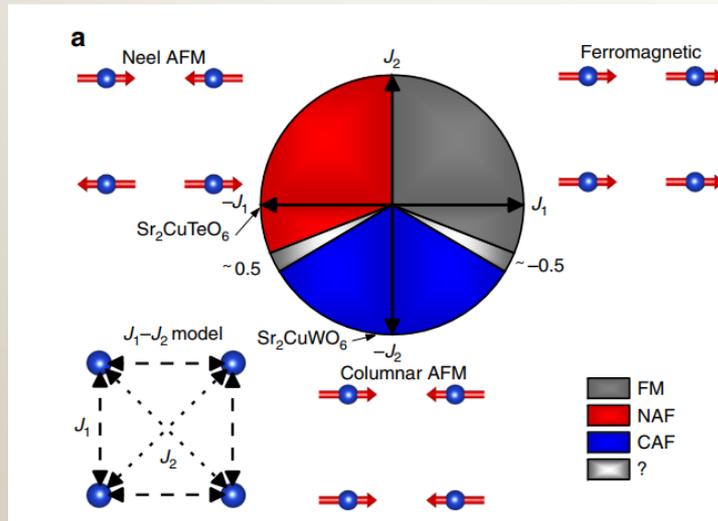
ARTICLE

DOI: 10.1038/s41467-018-03435-1

OPEN

Spin-liquid-like state in a spin-1/2 square-lattice antiferromagnet perovskite induced by $d^{10}-d^0$ cation mixing

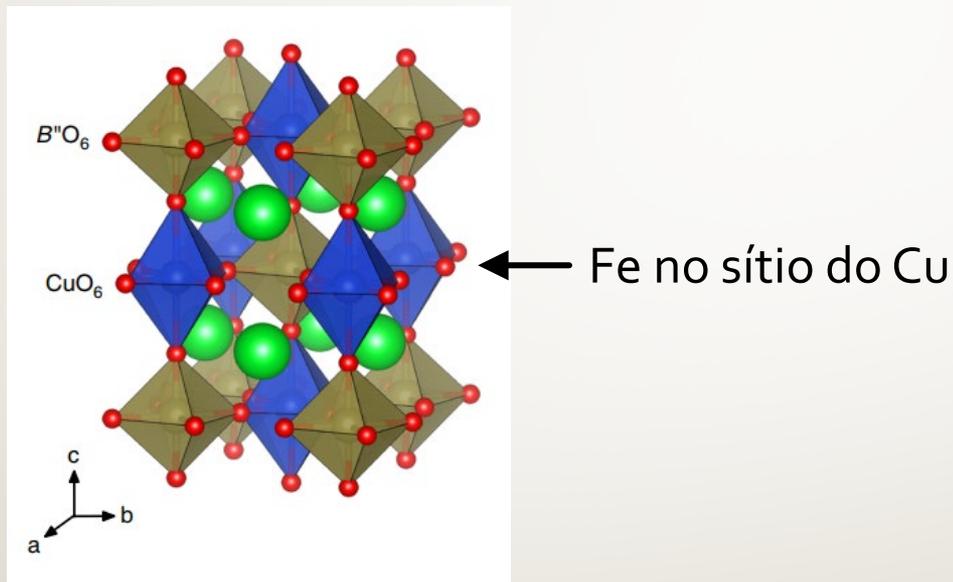
O. Mustonen¹, S. Vasala², E. Sadrollahi³, K.P. Schmidt³, C. Baines⁴, H.C. Walker⁵, I. Terasaki⁶, F.J. Litterst^{2,3}, E. Baggio-Saitovitch² & M. Karppinen¹



- Desordem estrutural
- QSL encontrado nas redes de Cu

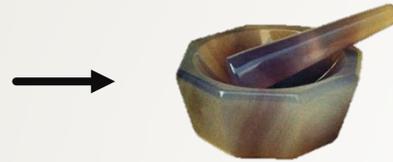
NOSSO TRABALHO

Estudo local através da Espectroscopia Mössbauer



Síntese de amostras $\text{Sr}_2(\text{Cu}_{1-x}\text{Fe}_x)(\text{Sb}_x\text{W}_{0.5}\text{Te}_{0.5-x})\text{O}_6$
para estudar o sistema $\text{Sr}_2\text{Cu}(\text{W}_{0.5}\text{Te}_{0.5})\text{O}_6$

Preparação das amostras



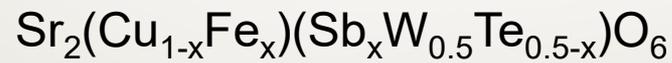
MOAGEM



TRATAMENTO TÉRMICO



PASTILHAGEM

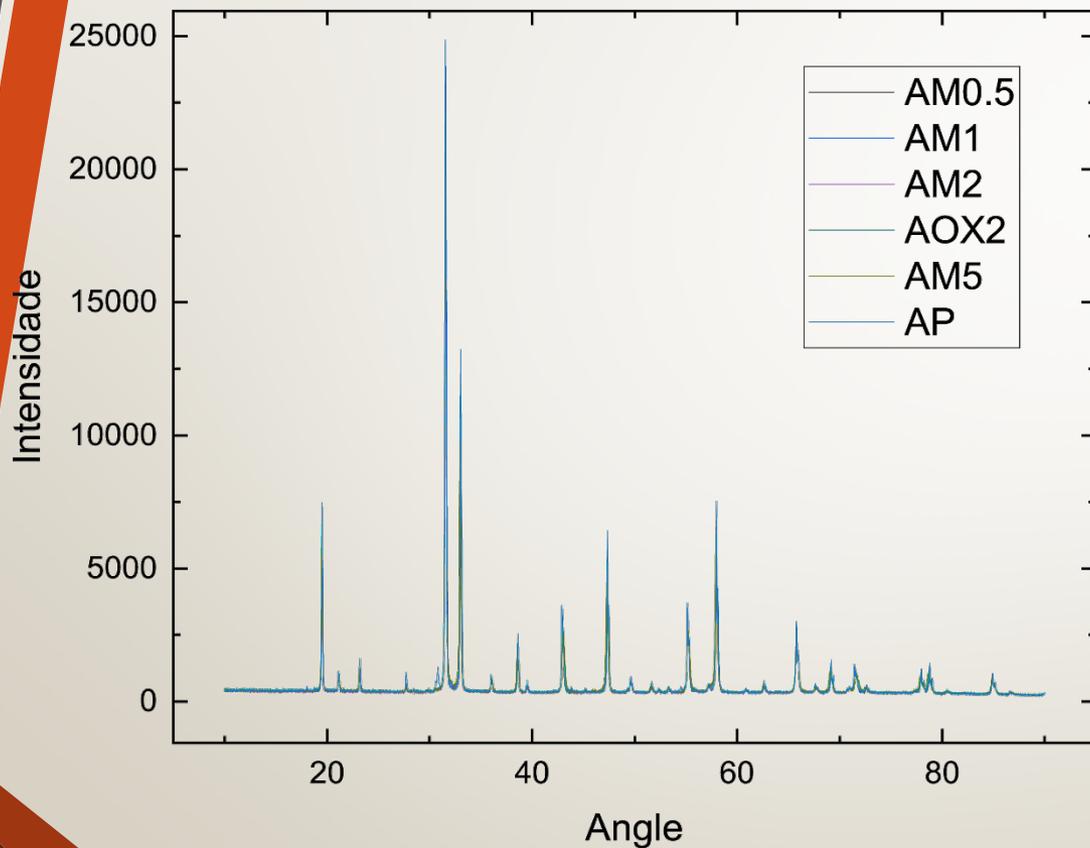


Nome	Percentual de Fe (%)	X
AP	0	0
AM0.5	0,5	0,005
AM1	1	0,01
AOX2	2	0,02
AM2	2	0,02
AM5	5	0,05

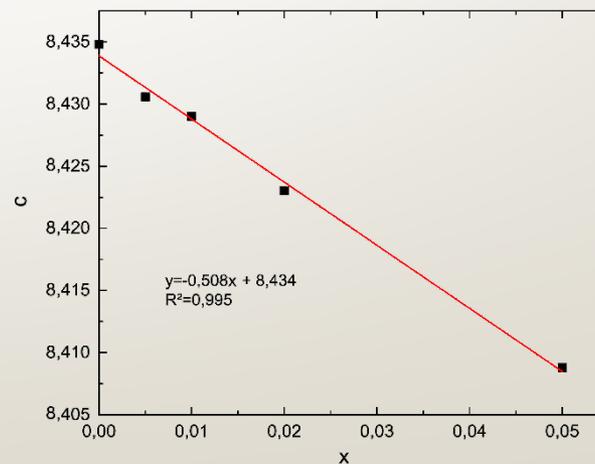
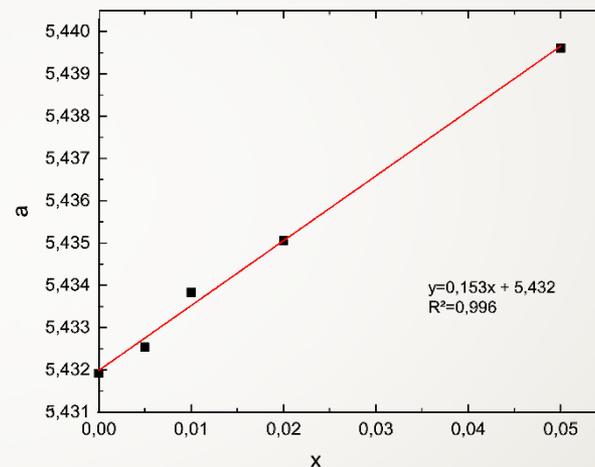
AM - Fe metálico / AOX - óxido

Imagens dos compostos obtidas na internet

Caracterização estrutural – Difração de Raio X

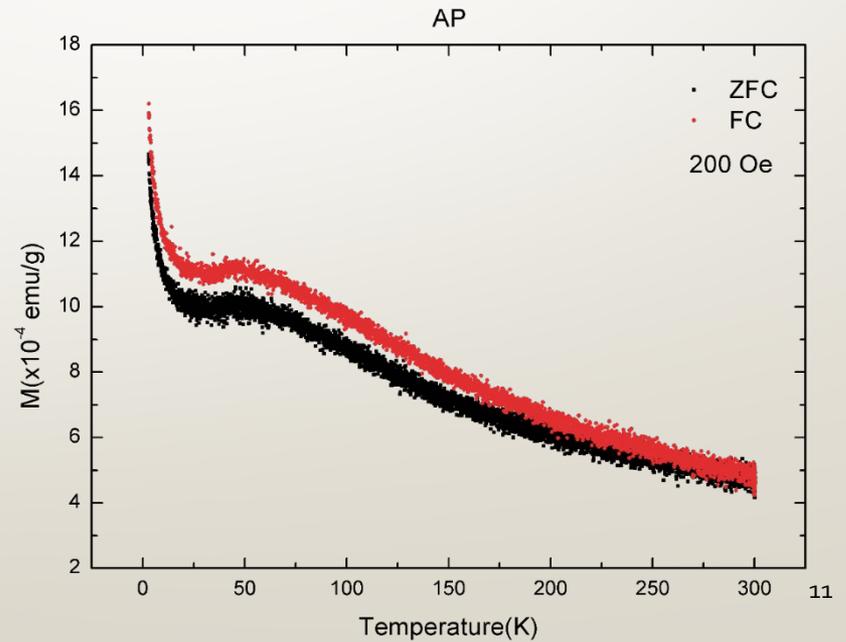
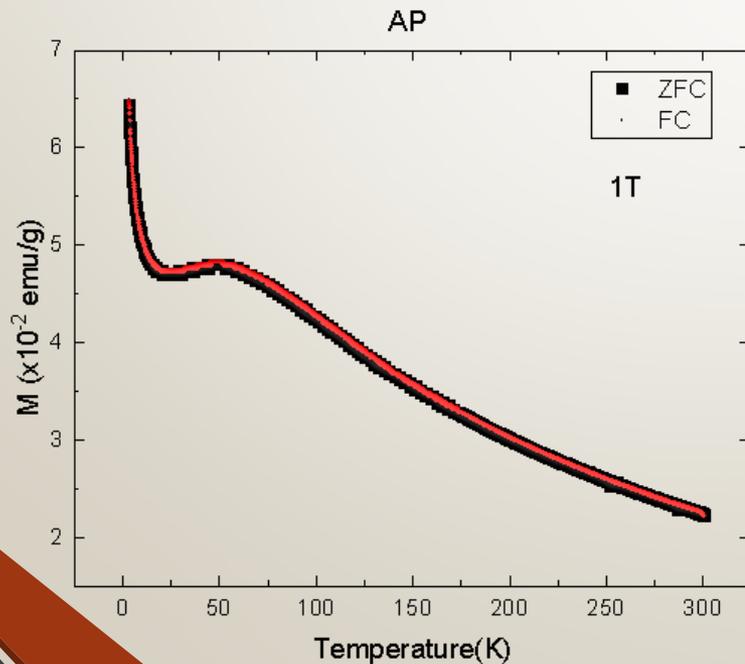
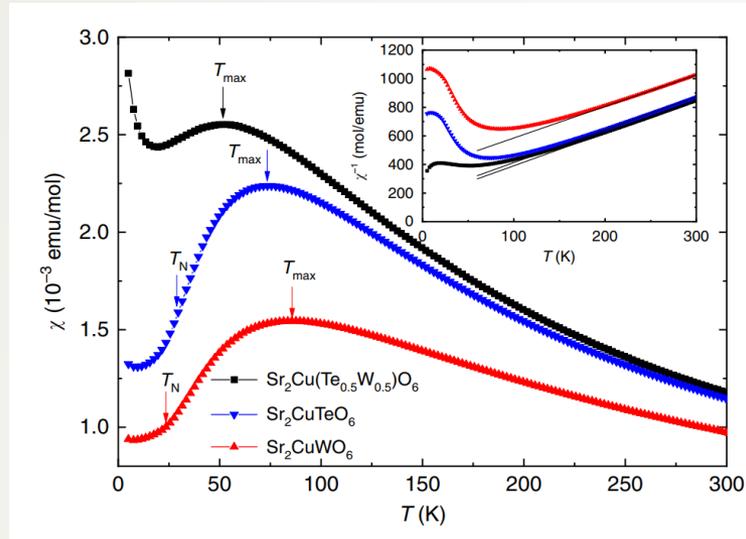


Mesma fase cristalina do composto puro

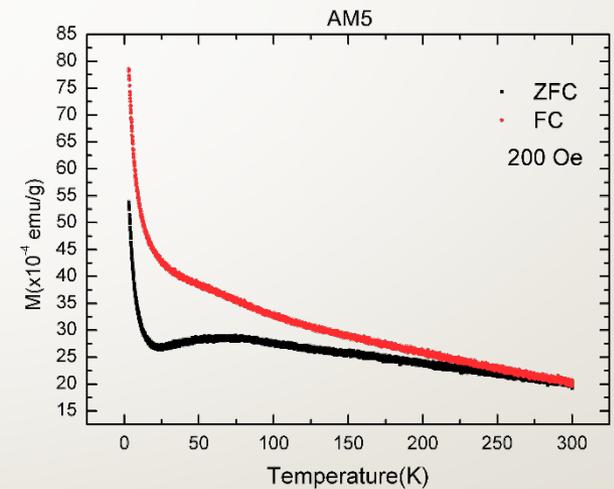
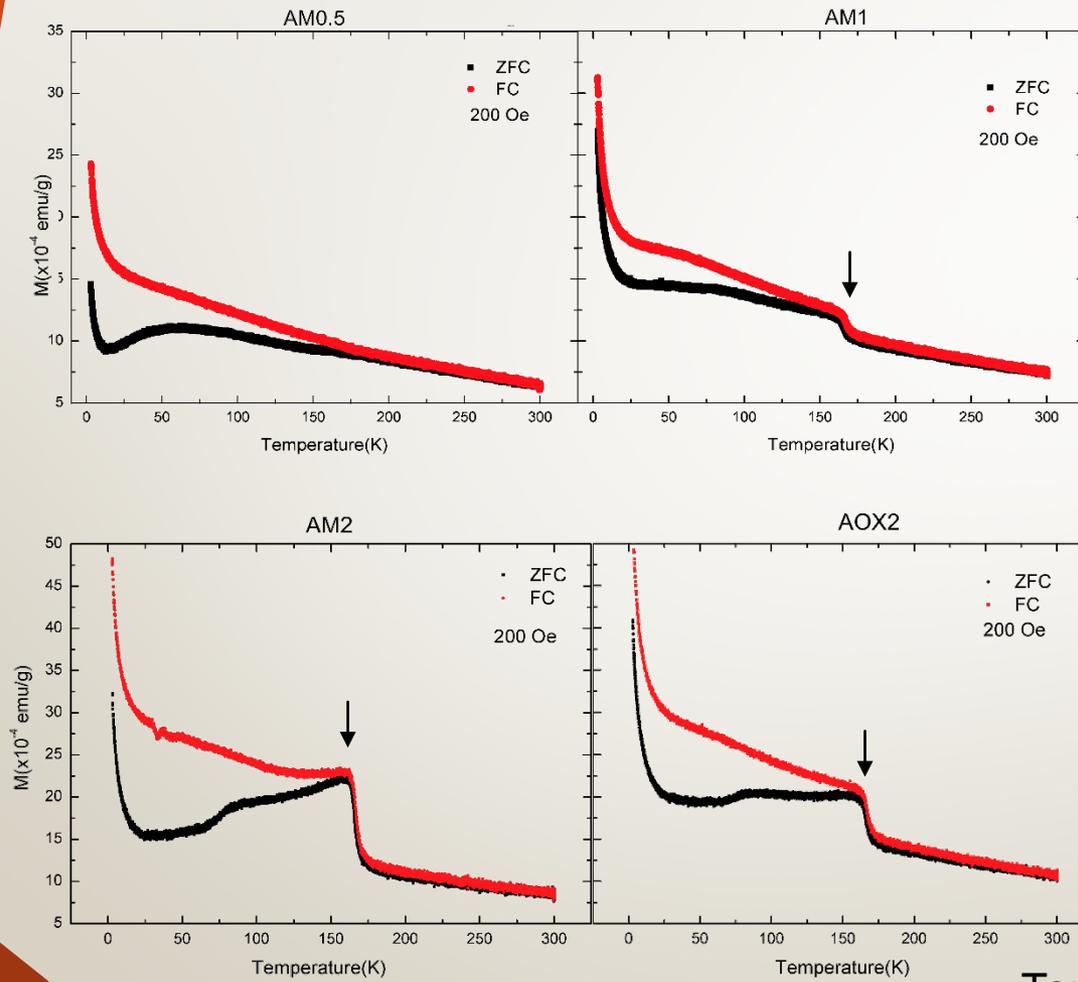


Parâmetros de rede

Medidas de Magnetização

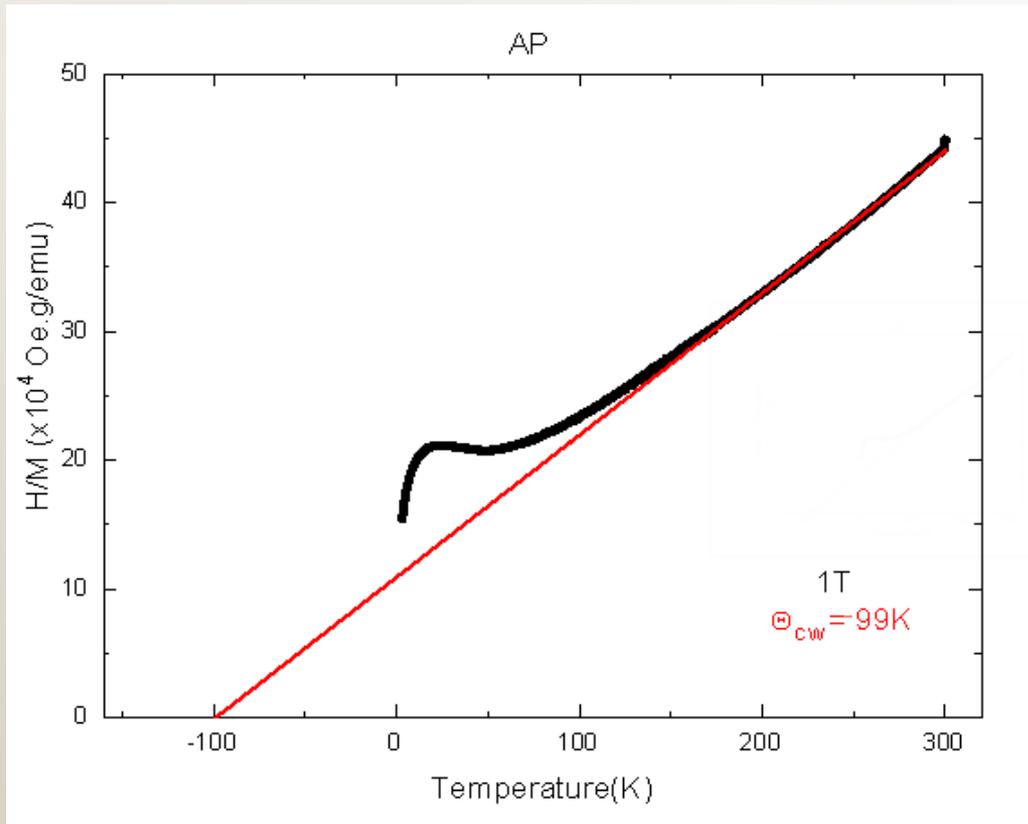


Magnetização em função da temperatura ($H=200$ Oe)



Temperatura de transição ~ 165 k

Temperatura de Curie-Weiss (θ_{CW})

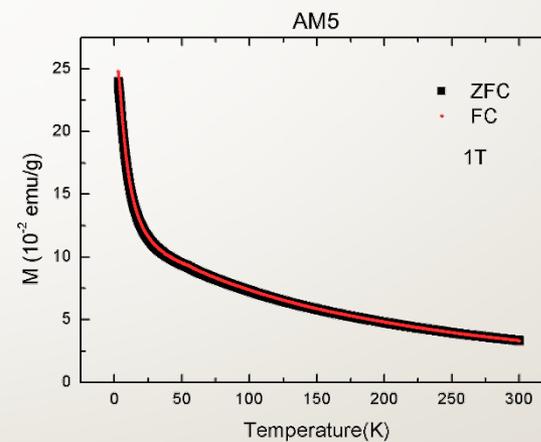
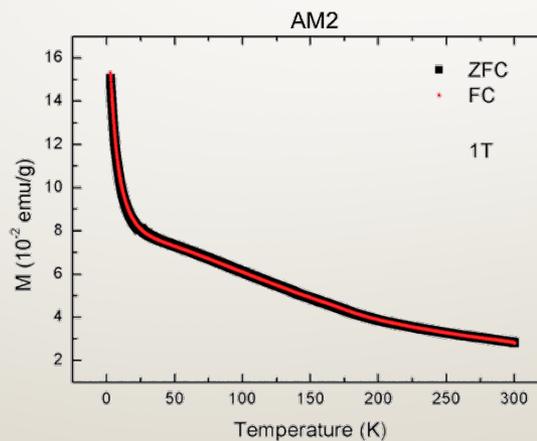
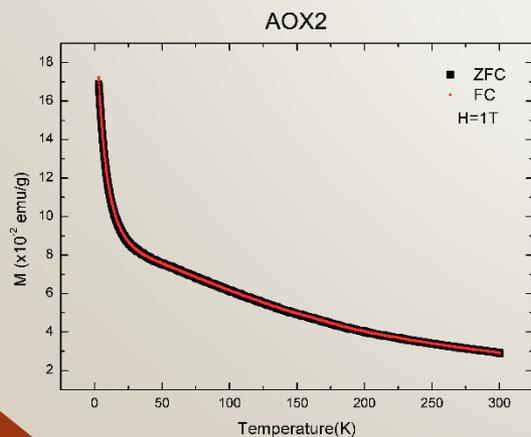
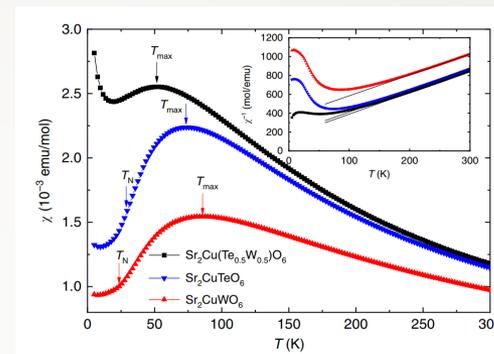
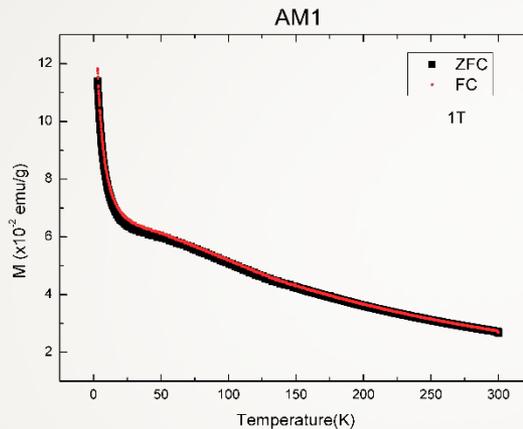
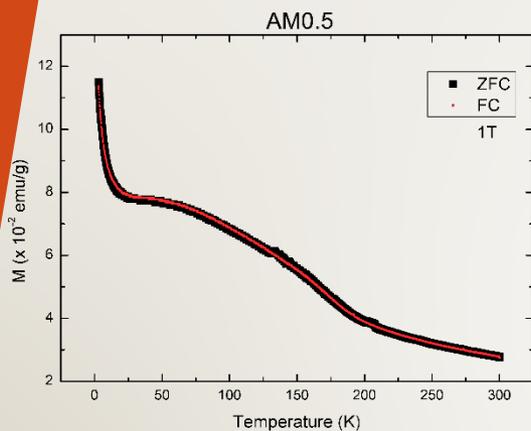


Temperatura de Curie-Weiss

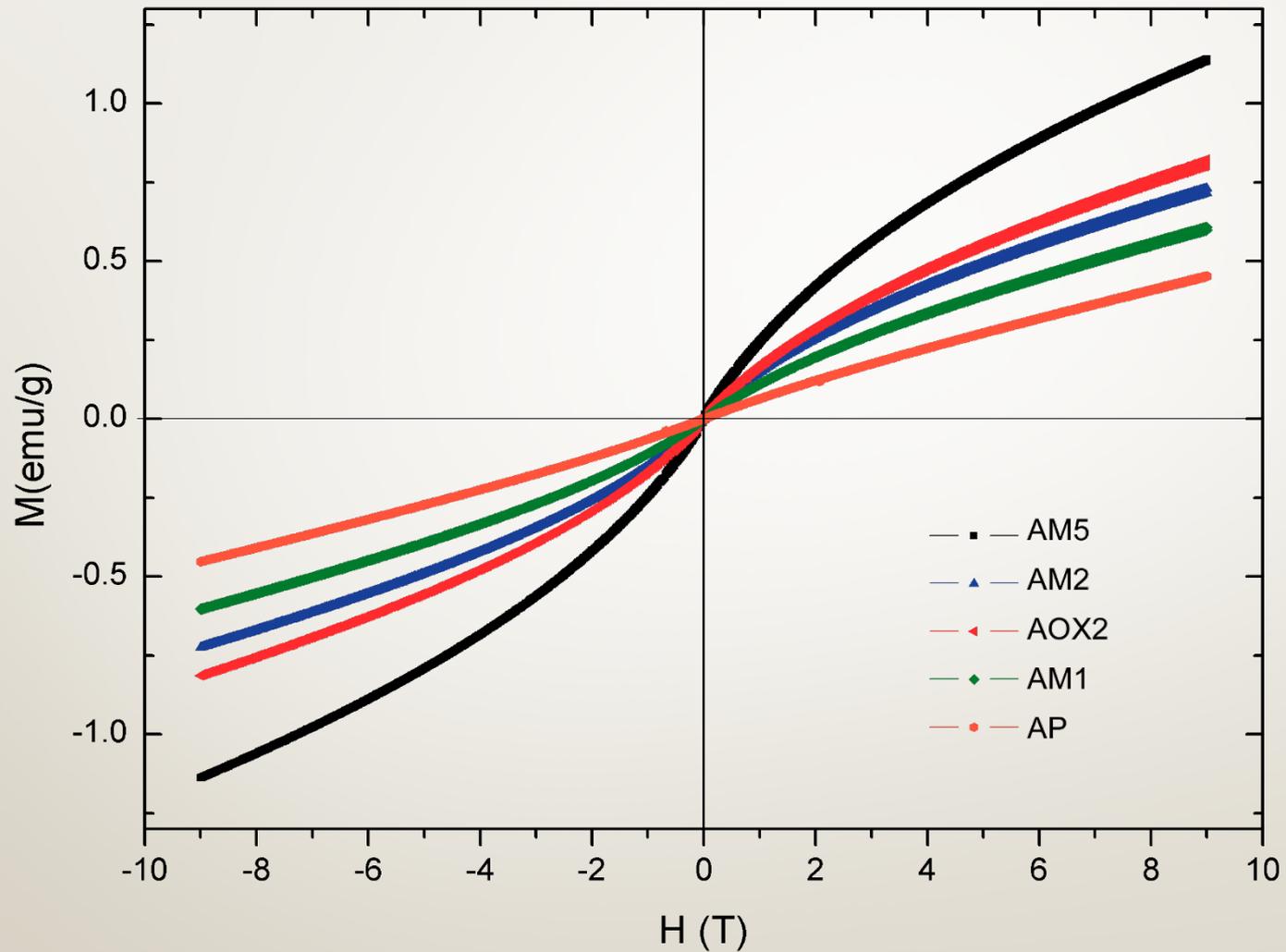
Amostra	θ_{CW}
AP	-99 K
AM0.5	-72 K
AM1	-100 K
AM2	-95 K
AOX2	-68 K
AM5	-154 K

- θ_{CW} negativa – interações predominantemente antiferromagnéticas para todas as amostras

Magnetização em função da temperatura (1 T)

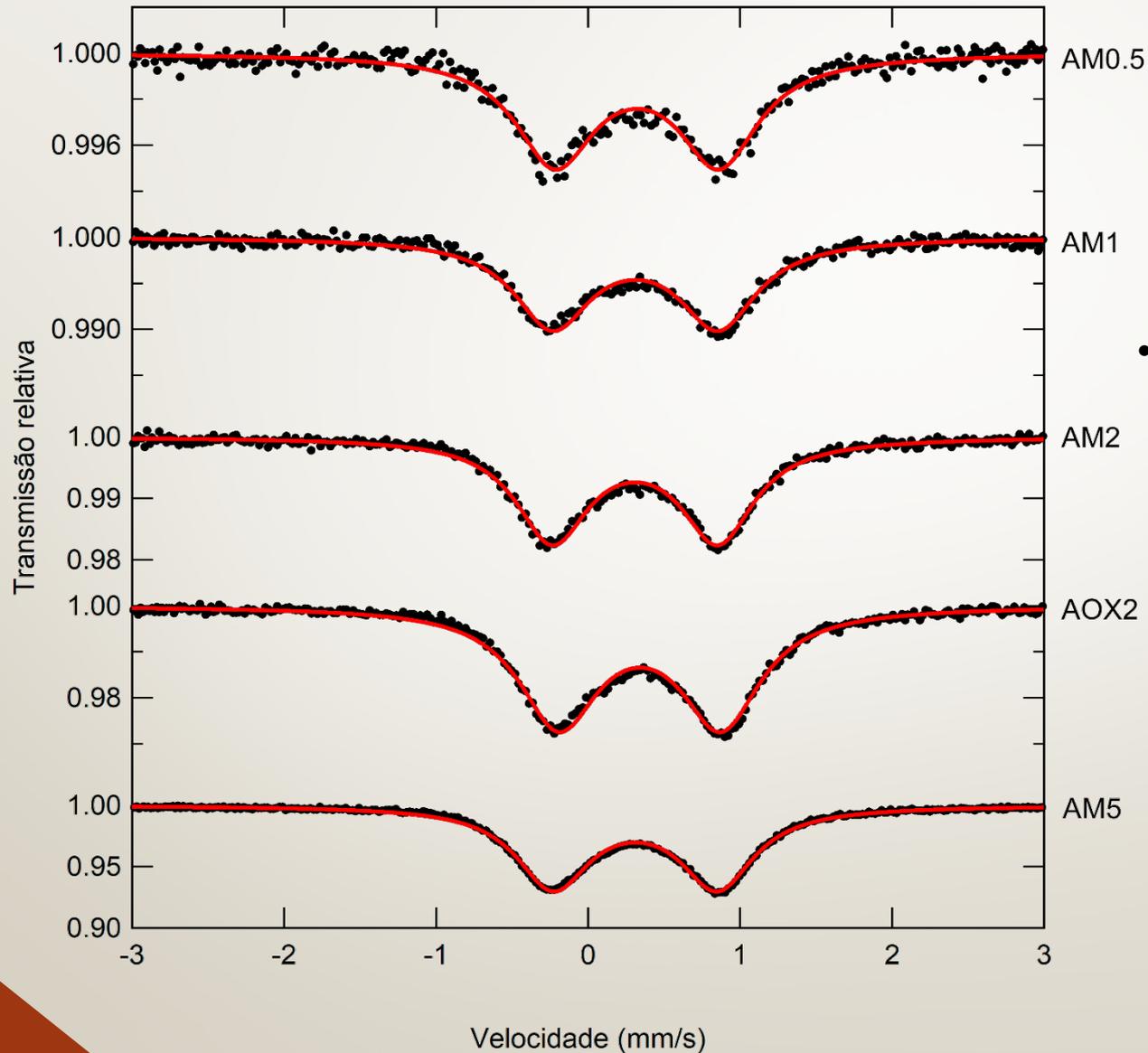


Medidas de Magnetização



Magnetização em função do campo magnético a 3 K

Espectroscopia Mössbauer

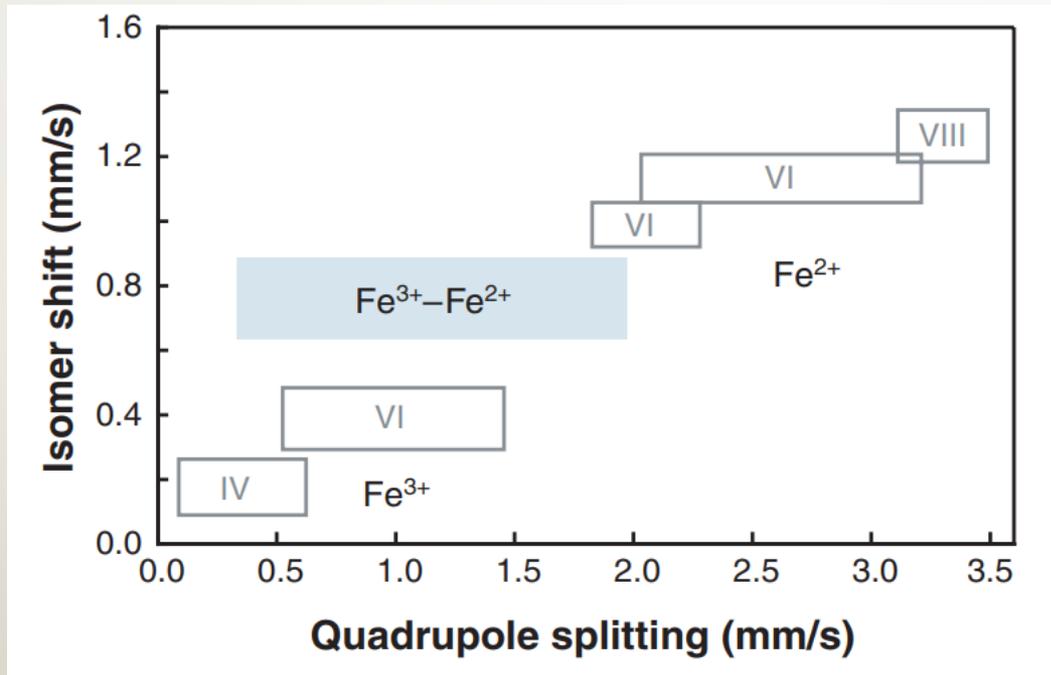


- Comportamento paramagnético à temperatura ambiente

Espectroscopia Mössbauer

Tabela dos parâmetros hiperfinos das 5 amostras

PARÂMETROS	AM0.5	AM1	AOX2	AM2	A5
WID	0.64	0.62	0.64	0.58	0.59
ISO	0.43	0.43	0.45	0.42	0.42
QUA	1.08	1.09	1.06	1.09	1.08



- Fe^{3+} em todas as amostras
- Sítio octaédrico de oxigênio

CONCLUSÕES

- Todas as amostras da série $\text{Sr}_2(\text{Cu}_{1-x}\text{Fe}_x)(\text{Sb}_x\text{W}_{0.5}\text{Te}_{0.5-x})\text{O}_6$ com fase única
- Átomos de Fe em sítio octaédrico com oxidação 3+
- Magnetização dos compostos com 0.5% e 1% de Fe semelhante ao composto com QSL
- Possíveis candidatos a apresentarem QSL : compostos com 0.5% e 1%
- Continuação do estudo destes dois compostos (Espectroscopia Mössbauer a LT, Medidas de calor específico e Susceptibilidade AC)