Resultados experimentais para transições de fase

16 de Março de 2016

Argônio

Análise de dados experimentais feita por Michael E. Fisher, em 1964:

PHYSICAL REVIEW VOLUME 136, NUMBER 6A 14 DECEMBER 1964

Specific Heat of a Gas Near the Critical Point

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(Received 17 July 1964)

Recent measurements of the constant-volume specific heat of argon (and of oxygen) at critical density and close to the critical point are compared with calculations based on the three-dimensional nearest-neighbor lattice gas models. It is argued that the configurational specific-heat density $C^*(T) = \rho C_{\text{config}}(T)/\rho_{\text{max}}$ should be compared with the theoretical configurational specific heat per lattice site. On this basis the calculations above T_c agree to within 10% with the observations for argon and are consistent with a divergence like $(T-T_c)^{-1/8}$ over the range $(T-T_c)/T_c = 10^{-2}$ to 10^{-4}. Below T_c the strength of the apparently logarithmic divergence of the specific heat for the fcc lattice agrees to within 10% with the experimental data but the theoretical magnitude of $C^*(T)$ is too small for $T > 0.9\,T_c$ by an almost constant amount of $1.05k$ per site.

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Medidas na vizinhança de T_c:

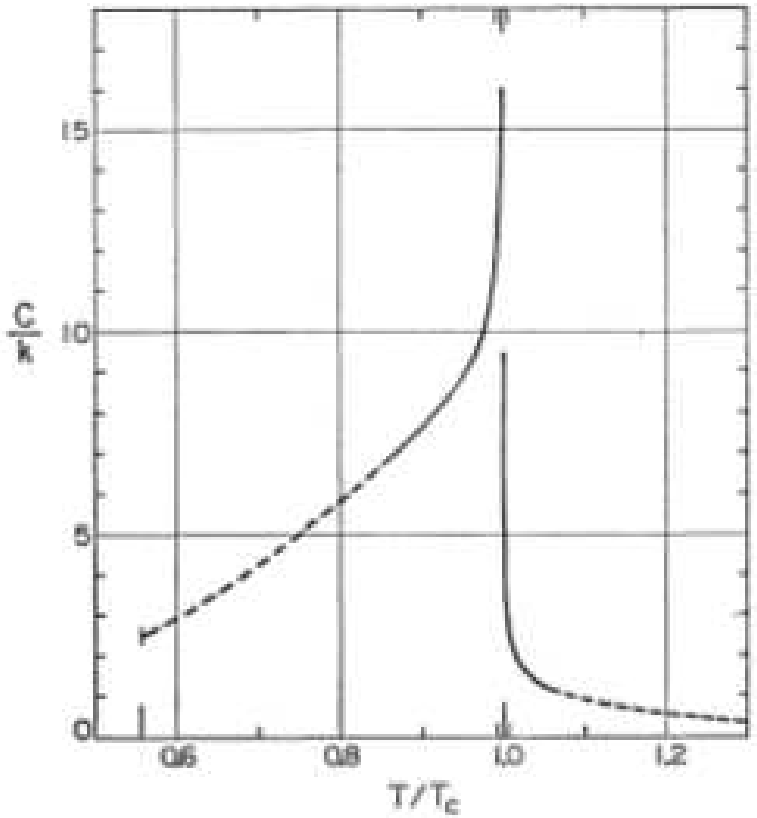

FIG. 1. Configurational specific heat of argon at constant critical density from the triple point to beyond the critical point. (The range of temperature marked on the axis close to $T/T_c=1$ is shown in detail in Fig. 2.)

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Medidas na vizinhança mais próxima de T_c:

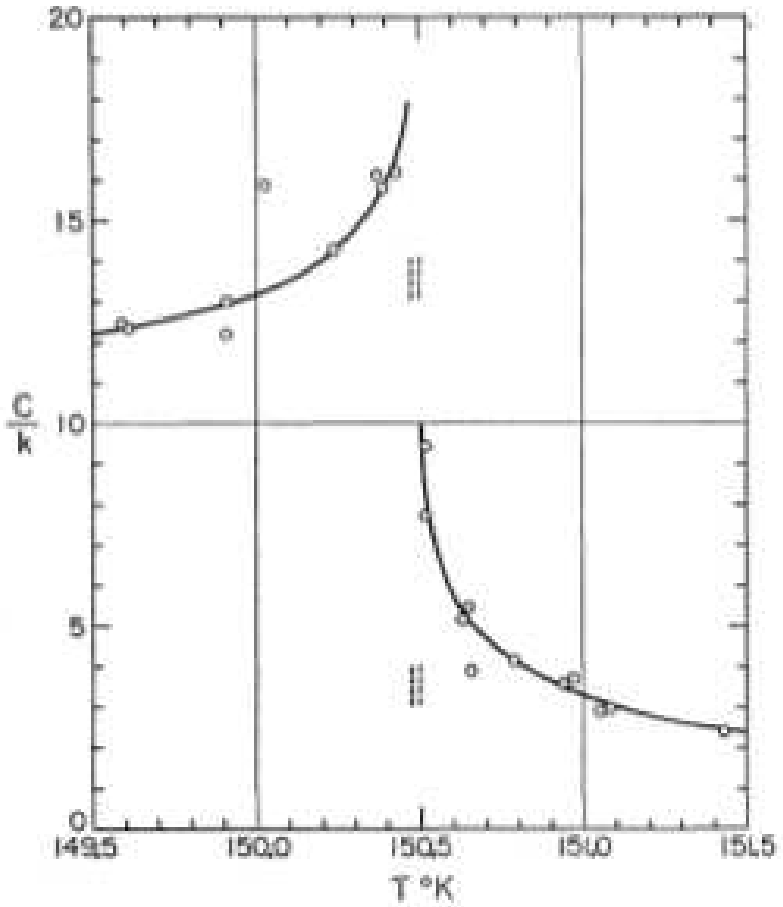

FIG. 2. Specific heat of argon close to the critical point showing the uncertainty in the determination of T_c.

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Comportamento crítico: lei de potência:

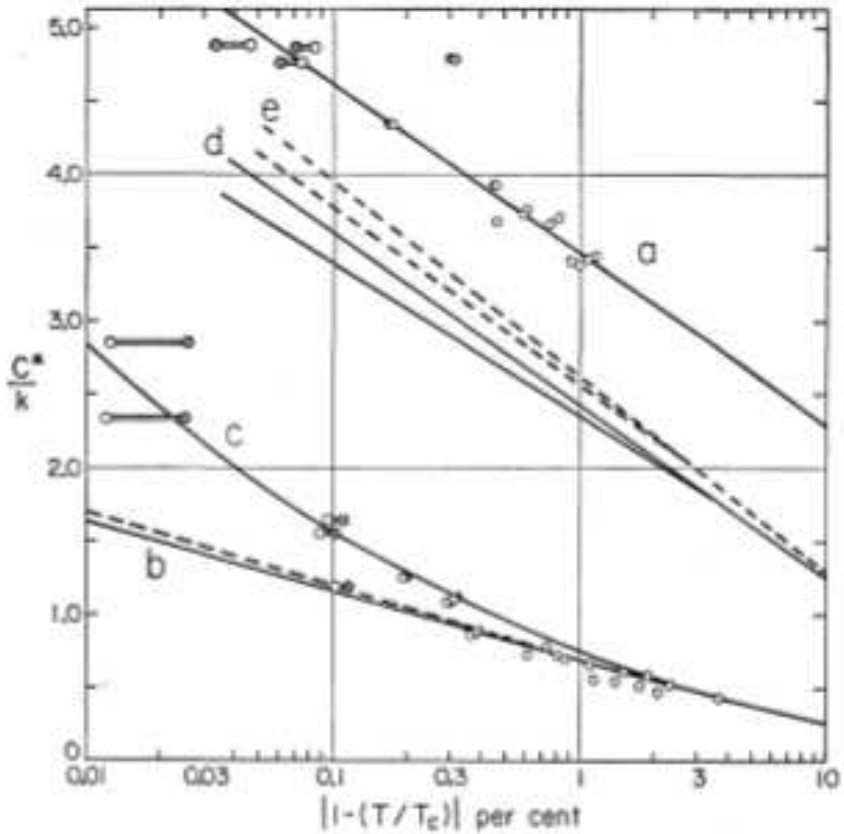

FIG. 3. Logarithmic plot of the specific-heat density $C^*(T)$ for argon [experimental points and curve (a)], and for lattice gas models; (b) above T_c assuming a logarithmic singularity (solid line fcc, dashed line s.c.); (c) above T_c assuming $\alpha = 0.20$ (fcc); (d) below T_c for the fcc lattice; (e) below T_c for the s.c. lattice.

Ferro

Análise de medidas de cator específico na vizinhança de T_c por F. L. Lederman, M. B. Salamon e L. W. Shacklette,Phys. Rev. B **9**, 2981 (1974):

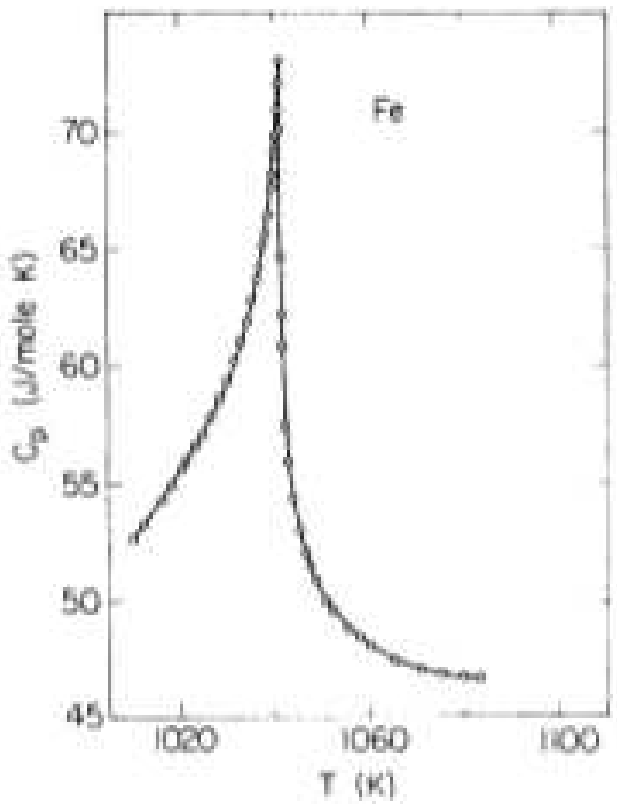

FIG. 2. Specific heat of iron plotted as a function of temperature.

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Comportamento de escala das medidas:

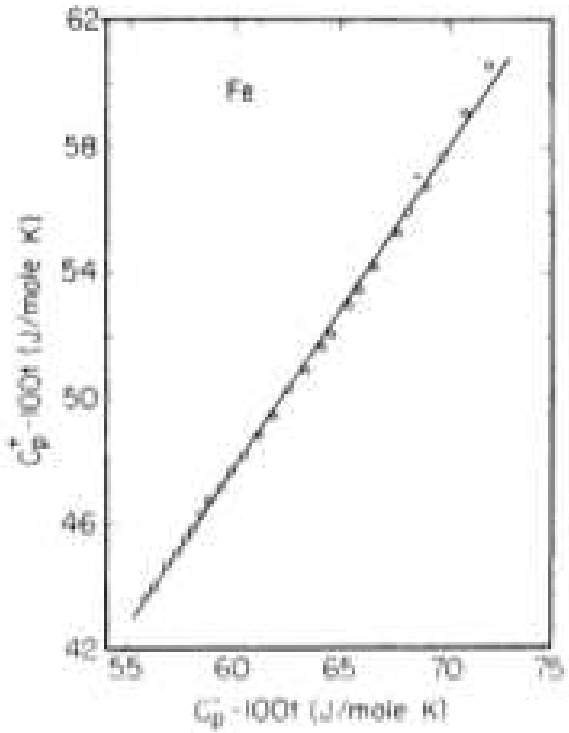


FIG. 3. Plot of interpolated specific heat, $\tilde{C}_p^+$, of iron for $T > T_c$ as a function of actual $\tilde{C}_p^-$ data for $T < T_c$ at equal values of $|t|$ after the linear lattice background has been subtracted off. The linear relation $\tilde{C}_p^+ = (-14.42 \pm 0.97) + (1.036 \pm 0.015)\tilde{C}_p^-$ shows strong evidence for the scaling law $\alpha = \alpha'$.

Ferro

Resultados para outros materiais magnéticos:

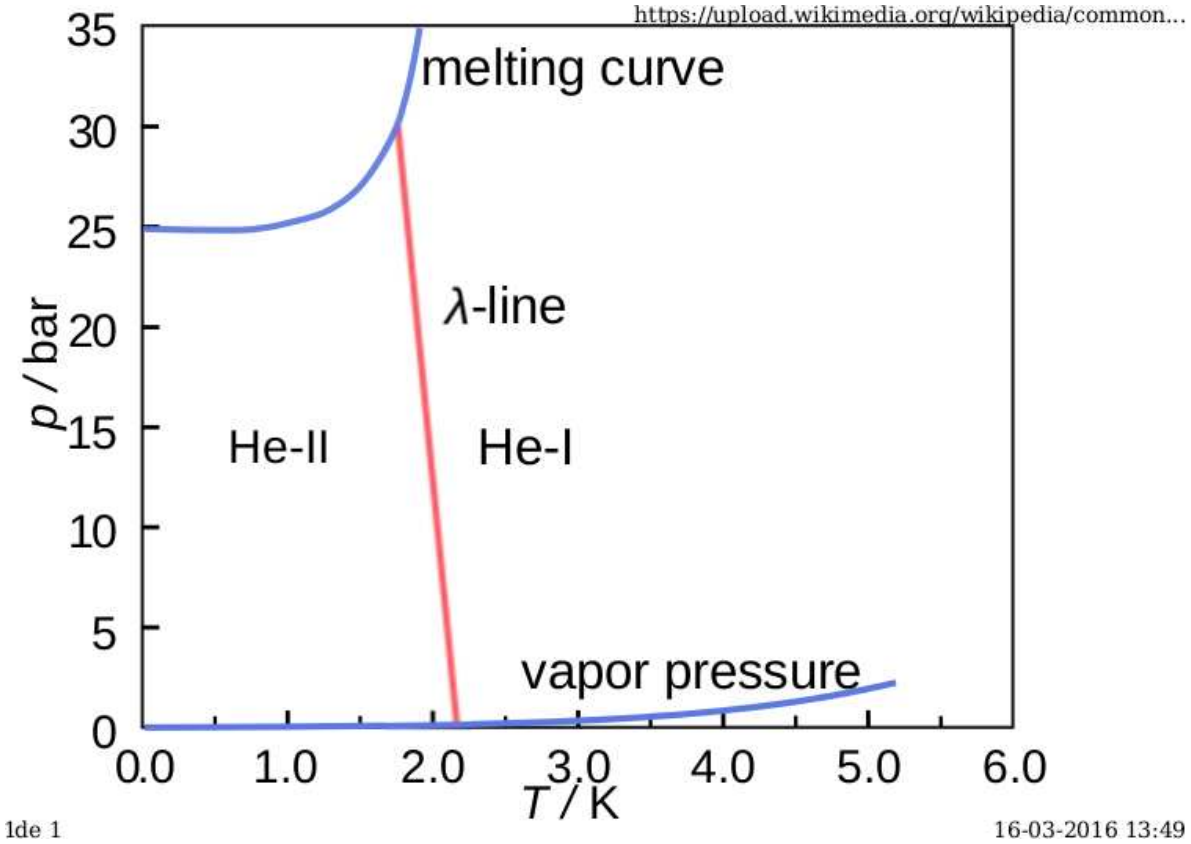
TABLE II. Values of the exponents, amplitude ratios, and other fitting parameters for Heisenberg magnetic materials. The references listed correspond to previous sources of the parameter shown in the table. References for the sources of other data are quoted in the text.

Material	Ref.	Temperature range ($x \equiv \log_{10} \lvert t \rvert$)	T_c(K)	C (J/mole K)	$B^+ - A^+ B^-/A^-$ (J/mole K)	A^+/A^-	r	A^+ (J/mole K)	B^+ (J/mole K)	$\alpha = \alpha'$
Fe		$-3.8 \le x \le -1.3$	1041.32[a]	100.0	-14.42 ± 0.97	1.036 ± 0.015	0.9974	7.503 ± 0.408	22.06 ± 0.88	-0.120 ± 0.01
Ni		$-3.5 \le x \le -1.0$	631.52	13.0	-13.714 ± 0.11	1.264 ± 0.003	0.9999	1.84 ± 0.02	26.06 ± 0.044	-0.089 ± 0.002
	21	$-3.2 \le x \le -1.6$	631.58		-4.311 ± 0.15	1.136 ± 0.008		1.609 ± 0.005	13.49 ± 0.03	-0.10 ± 0.03
	27	$-3.3 \le x$			-4.11 ± 1.0	1.06 ± 0.01		1.97 ± 0.01	26.2 ± 0.5	-0.12 ± 0.03
EuO	22	$-1.7 \le x \le -0.7$	69.33	24.1	-13.3 ± 2.5	1.00 ± 0.20		4.65 ± 0.42	15.8 ± 1.7	-0.09 ± 0.01
	22	$-3.2 \le x \le -1.7$	69.33	24.1	$+3.74 \pm 2.5$	2.03 ± 0.14		4.92 ± 0.33	13.3 ± 0.8	-0.026 ± 0.005
	23	$-2.7 \le x \le -1.3$	69.33			1.44				-0.04 ± 0.03
$RbMnF_3$		$-4.0 \le x \le -1.0$	83.05	76.60	-37.53 ± 1.62	1.36 ± 0.019	0.9910	5.935 ± 0.24	55.66 ± 0.57	-0.139 ± 0.007
	24	$-3.7 \le x \le -1.24$	83.08	76.638	-40.72	1.40 ± 0.04		6.305	53.248	-0.14 ± 0.002
Cu salts		$-2.7 \le x \le -0.28$	1.00	6.0	-5.92 ± 0.23	1.136 ± 0.023	0.9981	2.177 ± 0.12	-1.938 ± 0.20	-0.041 ± 0.014

[a]Relative value.

Hélio

Transição superfluida do Hélio:



Hélio

Resultados para a transição superfluida do Hélio (M. J. Buckingham e W. M. Fairbank (1965)):

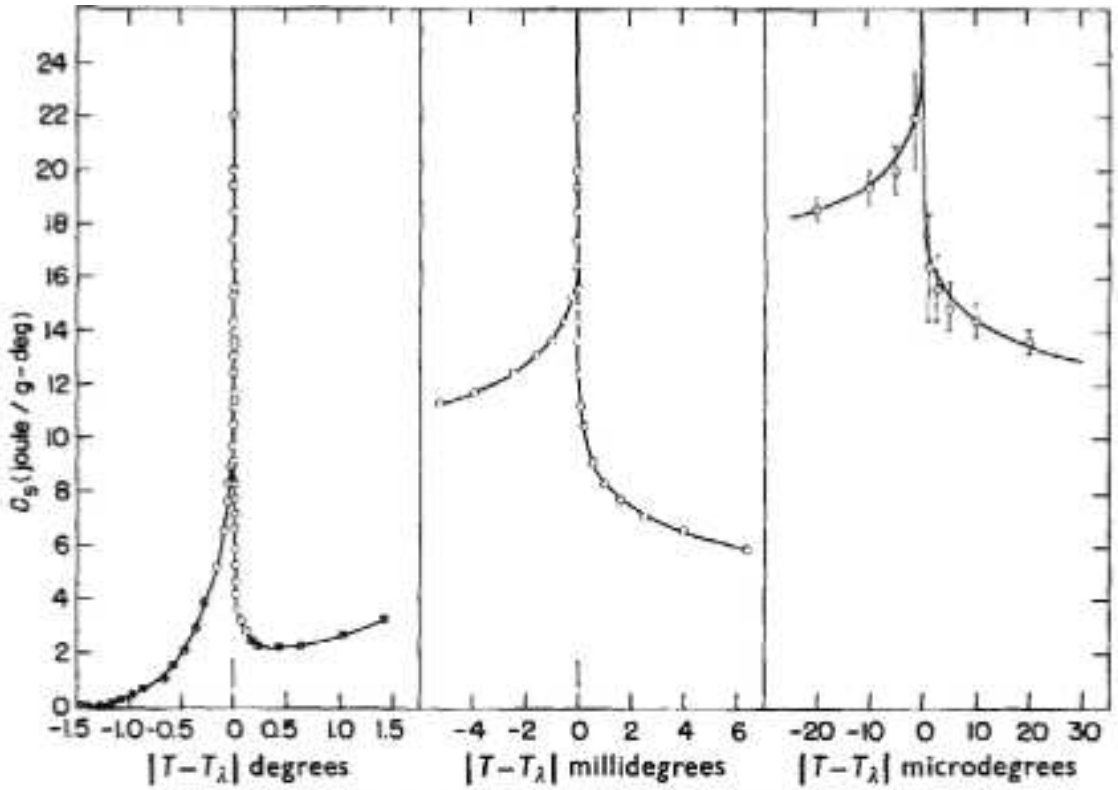


Fig. 2. Specific heat of liquid helium vs $T - T_\lambda$ in °K.
○ represent data of Kellers, Fairbank, and Buckingham[1]. ⊕ Represent, above 1.5° K, data of Hill and Lounasmaa[14] and Lounasmaa and Kojo[16]. ⊕ Represent, below 1.5° K, data of Kramers, Wasscher and Gorter[12]. Solid line represents empirical Eqs. (1) and (2). Width of small vertical line just above origin indicates portion of diagram shown expanded (in width) in the curve directly to the right.

Opalescência crítica

Transição de miscibilidade, metanol e ciclohexano (20°C até 50°C):
video: opalescência crítica