

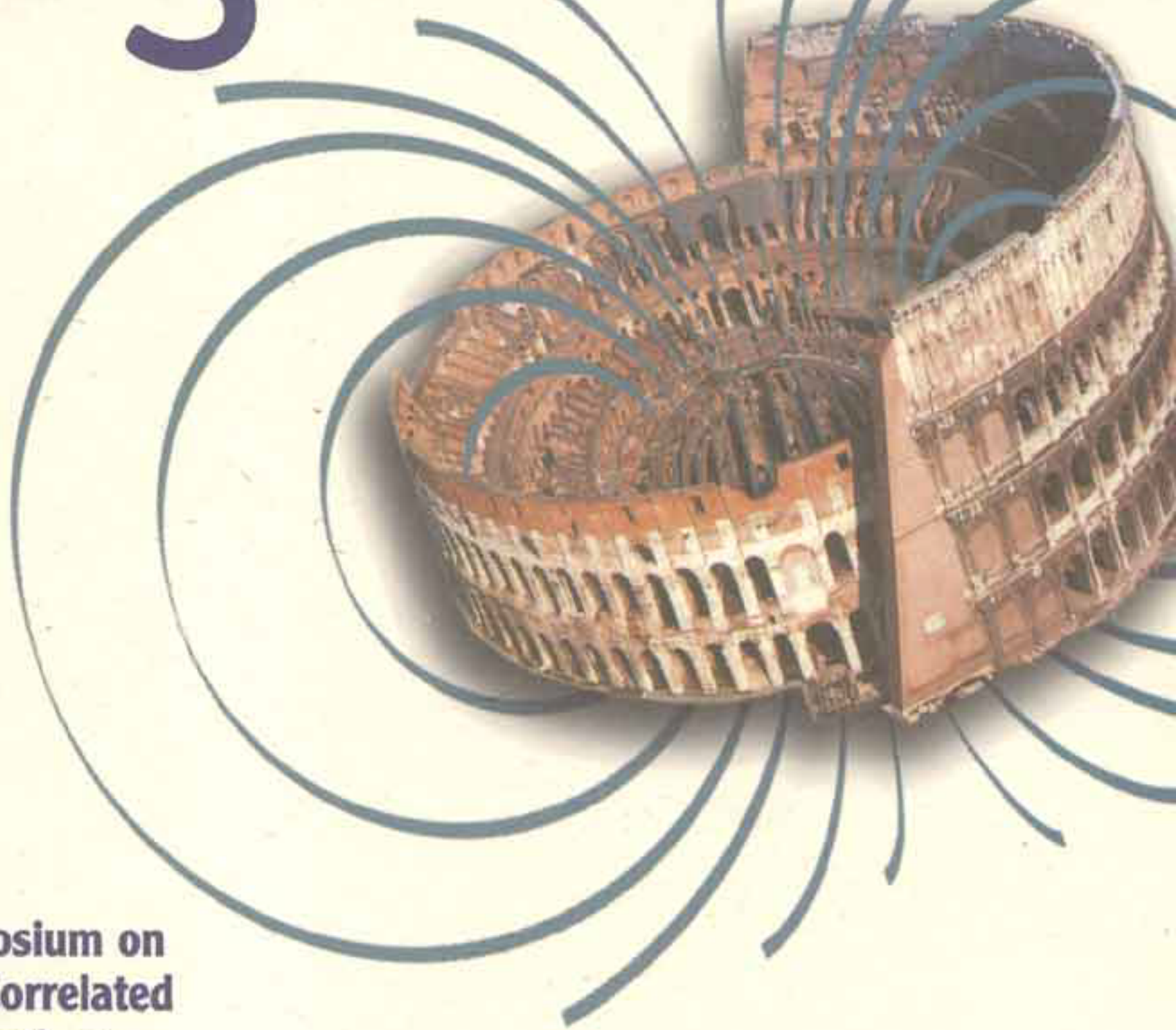
ICM 2003

ROMA, Italy • July 27 – August 1 • 2003

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on

Magnetism



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abstracts

1Y-pm-32—— EXCHANGE INTERACTION AND NEUTRON DIFFRACTION ON $\text{CoAl}_x\text{Fe}_{2-x}\text{O}_4$ ($x=0.1, 0.2$)

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Magnetic and structural properties of $\text{CoAl}_x\text{Fe}_{2-x}\text{O}_4$ with $x=0.1, 0.2$ have been investigated with thermal analysis (TG-DTA), x-ray, neutron diffraction, Mössbauer spectroscopy and magnetization measurements. Neutron diffraction measurements of $\text{CoAl}_{0.1}\text{Fe}_{1.9}\text{O}_4$ were obtained at various temperature ranges from 10 to 816 K. Neutron diffraction at 10 K revealed a cubic spinel space group $Fd3m$ with ferrimagnetic long range order. Mössbauer spectra were collected from 4 to 820 K. It is found that Debye temperatures of tetrahedral(A) and octahedral(B) site for $\text{CoAl}_{0.1}\text{Fe}_{1.9}\text{O}_4$ are $\Theta_A=746$, $\Theta_B=204$, respectively, and for $\text{CoAl}_{0.2}\text{Fe}_{1.8}\text{O}_4$, $\Theta_A=709$, $\Theta_B=197$, respectively. The temperature dependence of the magnetic hyperfine field in ^{57}Fe nuclei at the A and B sites was analyzed on the Néel type molecular field theory of magnetism. For the sample $\text{CoAl}_{0.1}\text{Fe}_{1.9}\text{O}_4$, the A-B and A-A superexchange interaction were antiferromagnetic with the strengths of $J_{A.B} = -23.3$ and $J_{A.A} = -18.0 k_B$, respectively, while the B-B superexchange interaction was ferromagnetic with a strength of $J_{B.B} = 5.6 k_B$. Also for the sample $\text{CoAl}_{0.2}\text{Fe}_{1.8}\text{O}_4$, the strengths of the A-B, A-A, and B-B interaction were $J_{A.B} = -21.3$, $J_{A.A} = -19.6$, and $J_{B.B} = 4.8 k_B$, respectively. The changes of exchange interactions with Al substitution are interpreted on the basis of cation distributions and bond lengths. It is interpreted that a noticeable strength of the A-A interaction are closely related to the covalency effects and neutron diffractions accord with these results.