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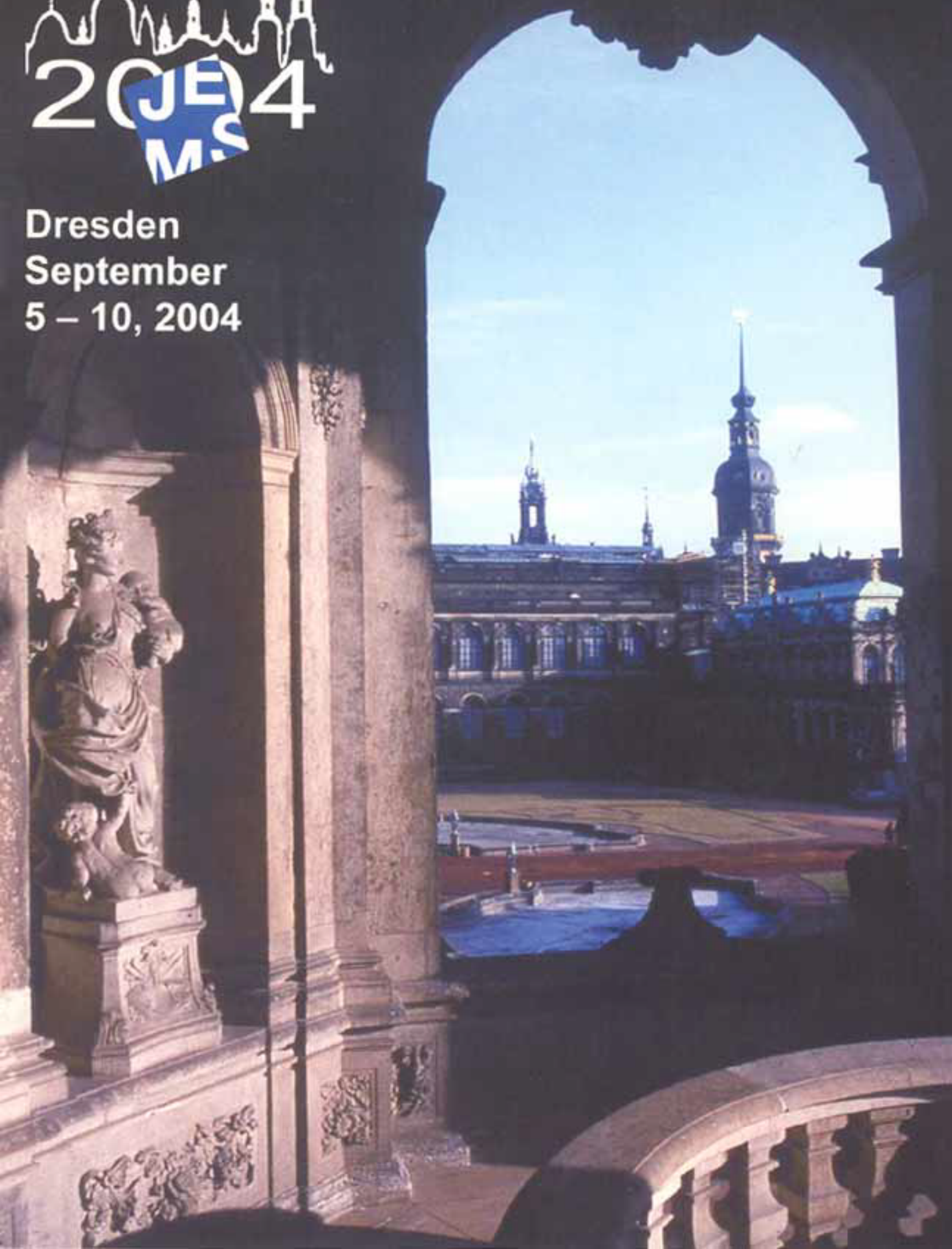

# SYNTHESIS AND MAGNETIC PROPERTIES OF $LiFe_5O_8$ POWDERS BY A SOL-GEL PROCESS

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$LiFe_5O_8$ ferrite has been prepared by a sol-gel method. Magnetic and structural properties of the powders were characterized with a Moessbauer spectroscopy, x-ray diffraction, vibrating samples magnetometer, thermogravimetry (TG) and differential thermal analysis (DTA). The decomposition of amorphous hydroxides in the dried precipitate continued until 525 K, according to a TG-DTA analysis. The crystal structure was found to be cubic spinel structure with a lattice constant $a = 0.833$ nm. $LiFe_5O_8$ powders that were annealed at and above 1273 K have a single phase spinel structure. However, powders annealed at 973, 1073, and 1173 K have a typical spinel structure with small amount of hematite ($\alpha - Fe_2O3$) phase. The $^{57}Fe$ Moessbauer spectra were fitted by a least-squares technique with two six-line subpatterns of Fe sites in the structure and corresponding to the $B$ and $A$ sites. The temperature dependence of the magnetic hyperfine fields at $^{57}Fe$ nuclei at the tetrahedral($A$) and octahedral($B$) sites are analyzed by the Neel theory of ferrimagnetism. The Neel temperature of $LiFe_5O_8$ was $T_N = 905 \pm 3K$. The isomer shift values at room temperature for the $A$ and $B$ patterns are found to be 0.18 mm/s and 0.21 mm/s relative to the Fe metal, respectively, which are consistent with high-spin $Fe^{3+}$ charge states. The saturation magnetization $M_S$ was 64.4 emu/g at room temperature under the applied magnetic field of 10 kOe annealed at 1273 K in air atmosphere for 6 h.