

Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

ESR Study of Spin and Charge Order in Organic Spin Chains

MICHAEL DUMM, BELAL SALAMEH, MARTIN DRESSEL, 1. Physikalisches Institut, Universität Stuttgart, 70550 Stuttgart, Germany, LAWRENCE K. MONTGOMERY, Department of Chemistry, Indiana University, Bloomington, IN 47405 — Interactions between spin, charge, and lattice degrees of freedom result in the extraordinary rich phase diagram of organic spin chain compounds with a whole sequence of ground states like charge order, spin-Peierls, or antiferromagnetism. We studied the quasi one-dimensional organic charge-transfer salts $(\text{TMTTF})_2X$ ($X=\text{PF}_6, \text{AsF}_6, \text{SbF}_6, \text{ClO}_4, \text{BF}_4, \text{Br}$ and SCN) by X-Band ESR experiments in the temperature range from 4 to 300 K or 500 K. At moderate and high temperatures, the magnetic susceptibility of these compounds can be described by a spin 1/2 antiferromagnetic Heisenberg chain. In this regime, all salts show a linear increase of the linewidth with temperature. The phase transitions into spin- and/or charge-ordered ground states lead to significant changes in spin susceptibility and ESR linewidth. From a detailed analysis of the temperature and angular dependence of our ESR data we extracted important information on the ground states properties. For example, our angular dependent measurements well below the charge-order transition uncover characteristic changes in the anisotropy of the linewidth which can be related to the charge-order patterns.

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Date submitted: 26 Nov 2004

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