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**Magnetoelectric effects in multiferroics**

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Magneto-electric phenomena were investigated in two different multiferroic systems: The strong coupling of dielectric and magnetic properties and the simultaneous occurrence of long-range magnetic and ferroelectric order are discussed for rare earth manganites and sulfo spinels. A phase diagram of $Eu_{1-x}Y_xMnO_3$ is established, which recovers the main features of the well-known magneto-electric phase diagram for the pure rare earth manganites $RMnO_3$. Here a variety of magnetic and electric phases emerge with varying rare earth ions R. As function of temperature and external magnetic field, also Y doped $EuMnO_3$compounds undergo a sequence of different magnetic and polar phase transitions for varying effective ionic radii of the rare earth ions. Special attention is paid to the occurrence of fundamentally new hybrid spin-electromagnetic excitations, which we name electromagnons and are characterized as spin waves that can be excited by an ac electric field. These excitations are identified in $Eu_{1-x}Y_xMnO_3$with x = 0.2, in $GdMnO_3$, and in $TbMnO_3$. Specifically in $GdMnO_3$ the electromagnons can easily be suppressed by external magnetic fields and allow tuning the index of refraction by moderate fields. In the second part we discuss the simultaneous appearance of colossal magneto-resistance (CMR) and colossal magneto-capacitance (CMC) effects in chromium sulfo spinels. In $CdCr_2S_4$ ferromagnetism of localized Cr spins evolves at 85 K, while polar order is established below 130 K. The onset of ferroelectric order is neither accompanied by the occurrence of soft modes nor by structural changes which break the inversion symmetry of the high-temperature cubic phase. $HgCr_2S_4$ becomes ferroelectric close to 70 K while a complex antiferromagnetic order is found below 25 K. CMR and CMC effects are specifically strong in the mercury compound, as moderate magnetic fields of only 0.1 T induce ferromagnetism at much higher temperatures. We speculate that the occurrence of ferroelectricity in these multiferroic compounds is rather of electronic than of ionic origin.