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Magnetoelectric effects in the spin 1/2 XX chain with three spin interactions and Dzyaloshinskii-Moriya interaction¹ P DURGANANDINI, Department of Physics, SP Pune University, Pune - 411007, India — We consider the spin 1/2 XX chain with three spin interactions of the XZX+YXY and XZY-YZX types in an external magnetic field and with Dzyaloshinskii-Moriya (D-M) interaction. Interpreting the D-M interaction as a local electric polarization, we study the magnetoelectric effects in the system by using the exact solution of the problem. We obtain the ground state phase diagram by calculating the electric polarization, magnetization and isentropes. There are various regimes of magnetic and electric polarization depending on the relative strengths of the three spin interaction as well as that of the external fields. For a certain range of three spin interaction strengths, the system shows the existence of finite magnetization and electric polarization even in the absence of any external fields. The external electric and magnetic fields modify the ground state phases and can be used to tune the various regimes. We also calculate the entropy and analyze the electrocaloric and magnetocaloric effects. We show that the electrocaloric and magnetocaloric effects can be used to obtain information about the magnetoelectric effects in the system.

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