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Ferroelectricity of carbon based materials NATASHA KIROVA, LPS, CNRS & University Paris-Sud, Orsay, France, SERGUEI BRAZOVSKII, LPTMS, CNRS & University Paris-Sud, Orsay, France — We discuss the possibility of ferroelectric carbon-based materials: organic crystals, conducting polymers and graphene ribbons. Ferroelectricity related to the charge ordering was discovered in quasi-1D organic conductors $(TMTTF)_2X$, and in layered compounds like δ-(EDT-$TTFCONMe_2)_2Br$. A microscopic picture is based on two coexisting symmetry lowering effects: the dimerization of bonds (which is build-in) and the dimerization of sites (which is a spontaneous symmetry breaking). Today we can look for a possibility of a ferroelectric polymer. The difference with respect to $(TMTTF)_2X$ is the reverse of the build-in (sites) and spontaneous (bonds) effects of dimerizations. Such an $(AB)_x$ polymer has already appeared, studied for nonlinear optical properties, but not tested for the the ferroelectricity. The theory predicted an existence of solitons with non-integer variable charges, both with and without spin i.e. walls separating domains with opposite electric polarisation. Their physics will serve to relate transient ferroelectric processes and the visible range optics. For the case of zigzag edges of graphene ribbons the build-in dimerization is originated by different chemical surrounding of carbon atoms and the spontaneous one can be the result of Peierls transition along the edges.

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