HIGH - PRESSURE EFFECT ON INTERNAL STRUCTURE AND ATOMIC DYNAMICS OF PHARMACEUTICAL COMPOUNDS

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Due to the wide variety of phenomena realized in organic crystals at high pressure: polymorphic phase transitions, amorphization, etc., studies of pressure-induced changes in the crystal structure and atomic dynamics of complex molecular crystals is an urgent task in condensed matter physics [1,2]. In addition, structural studies of molecular crystals are important for optimization the of pharmaceutical production process, where, under additional mechanical influences (grinding or tabletting), irreversible polymorphic phase transitions or its amorphization can develop in the initial material, which entails significant changes in the physicochemical and pharmaceutical properties material. [3].
The use of high-pressure diffraction and Raman spectroscopy to study pharmacological components makes possible investigation of their structure and physical properties in the most complete way, which is necessary to understanding the nature and mechanisms of physical phenomena observed in them [4].
Therefore, the main objective of this study was detail investigation of physical properties and dynamics of the group of pharmaceutical compounds by means of different methods: X-ray diffractometry and Raman spectroscopy.
Investigation of internal structure and atomic dynamics of pharmacological components hypolipidemic agent lovastatin $C_{24}H_{36}O_5$ and antibacterial agent ofloxacin $C_{18}H_{20}FN_3O_4$ were carried out.
The pressure dependence of vibrational modes of lovastatin measured at high pressures up to 9.8 GPa and room temperature were shown. The changes in a pressure behavior of the Raman lines were observed at pressures 3 and 5.2 GPa. Those changes can indicate the polymorphic phase transitions lovastatin under pressure. At pressures above 9 GPa a gradual broadening of Raman lines is followed by their disappearance up on further compression. Such a behavior corresponds to a gradual phase transition to the amorphous phase of lovastatin.
At pressure P>4.8 GPa, several changes in the X-ray diffraction data and Raman spectra of ofloxacin were observed, which indicate a pressure-induced phase transformation from initial form to HP-form of ofloxacin. Around this phase transformation, the noticeable anomalies in the pressure behaviour of different vibration frequencies of ofloxacin were found.
At P>7.3 GPa a gradual broadening of Raman modes, followed by disappearance of the most of them at about 10 GPa, were observed. Such a behavior corresponds to a gradual phase transition to the amorphous phase of the ofloxacin.
The structural mechanisms of the phase transitions in presented pharmaceutical compounds were discussed.

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