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A study high pressure effect on the vibrational spectra of ranitidine hydrochloride

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Ranitidine hydrochloride (C13H22N4O3S*HCl) is an inhibitor of gastric acid secretion and used to block acid production in the stomach, for indigestion, acid reflux, heartburn, peptic ulcer and treatment of ZollingereEllison syndrome [1]. Polymorphs are different crystalline forms of a drug that may have different physico-chemical properties and biological activities. Since pharmaceuticals, at some stage during the manufacturing process, are organic crystalline materials, polymorphism may affect these products during new drug development and formulation [2,3].*

*Crystalline ranitidine is polymorphic and exists in two crystalline forms known as Form 1 and Form 2, and in several pseudopolymorphic forms [4]. The application of pressure can change the hydrogen bond array dramatically and could add an instability into the polymorphic forms of the pharmaceutical compounds [5]. At ambient conditions the Raman spectra of C13H22N4O3S*HCl corresponds to form II characteristic vibrational spectra [6].

The aim of this work was to analyze the vibrational spectra of the ranitidine hydrochloride by using Raman spectroscopy at pressures up to 11.2 GPa. The experiment was conducted in Frank Laboratory of Neutron Physics. Raman spectra at ambient temperature and pressures were collected using a LabRAM HR spectrometer (Horiba Gr, France) with a wavelength excitation of 633 nm emitted from He-Ne laser, 1800 grating, a confocal hole of 100 mm, and x50 objective.

At pressure P > 1.2 GPa, several significant changes in the Raman spectra were observed. These changes can indicate the new form of the ranitidine hydrochloride.

At P > 6.2 GPa a gradual broadening of most Raman lines was observed. The subsequent pressure increasing until P = 9.2 GPa followed by the disappearance of almost all Raman modes. Such a behavior corresponds to a gradual phase transition to the amorphous phase of the ranitidine hydrochloride.

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