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**Piezoelectric properties of tissues – Właściwości piezoelektryczne tkanek. Część I. Mechanizmy powstawania efektów piezoelektrycznych w tkankach.**

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The paper reviews investigations concerning piezoelectric properties of organic compounds and tissues. The origin of the tissues polarization induced by stress is supposed to be caused by the reorientation of polar groups in the molecules. The results of experiments indicate that the piezoelectric effect found in tissues arises from organic components such as collagen in bone and tendon (polar groups CO and NH) or cellulose in wood (polar group OH). The changes in piezoelectric constants presented as a function of temperature, water content, frequency of applied stress and sample orientation suggest some molecular interpretation of the effect. The anisotropy of the piezoelectric modulus indicates the preferred orientation of piezoelectric fibrous molecules including collagen. The matrix of piezoelectric moduli for bone and wood is consistent with the suggestion that intermolecular croslinks in the collagen and cellulose fibers play a substantial role in the piezoelectric polarization of organic substances. The results of the bone and tendon bending are presented and interpreted by extending the classical theory of piezoelectricity including the contribution of the stress gradient in the formation of the piezoelectric voltage. The piezoelectric constants were measured by three different experimental techniques: measurements of the polarization in the direct piezoelectric effect, a null technique of neutralization of the electric field across the sample and comparative measurements of the converse effect. The phase angle between the applied dynamic stress and the resulting polarization can be represented as the real and imaginary components of the complex piezoelectric constant.