

Nondestructive Monitoring of Atomic Reactions to Detect Precursors of Structural Failure

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Abstract : This article was written to substantiate the possibility of detecting the precursors of catastrophic destruction of a structure or device and stopping operation before it. Damage to solids results from breaking the bond between atoms, which requires energy. Modern theories of strength and fracture assume that such energy is due to stress. However, in a letter to W. Thomson (Lord Kelvin) dated December 18, 1856, J.C. Maxwell provided evidence that elastic energy cannot destroy solids. He proposed an equation for estimating a deformable body's energy, equal to the sum of two energies. Due to symmetrical compression, the first term does not change, but the second term is distortion without compression. Both types of energy are represented in the equation as a quadratic function of strain, but Maxwell repeatedly wrote that it is not stress but strain. Furthermore, he notes that the nature of the energy causing the distortion is unknown to him. An article devoted to theories of elasticity was published in 1850. Maxwell tried to express mechanical properties with the help of optics, which became possible only after the creation of quantum mechanics. However, Maxwell's work on elasticity is not cited in the theories of strength and fracture. The authors of these theories and their associates are still trying to describe the phenomena they observe based on classical mechanics. The study of Faraday's experiments, Maxwell's and Rutherford's ideas, made it possible to discover a previously unknown area of electromagnetic radiation. The properties of photons emitted in this reaction are fundamentally different from those of photons emitted in nuclear reactions and are caused by the transition of electrons in an atom. The photons released during all processes in the universe, including from plants and organs in natural conditions; their penetrating power in metal is millions of times greater than that of one of the gamma rays. However, they are not non-invasive. This apparent contradiction is because the chaotic motion of protons is accompanied by the chaotic radiation of photons in time and space. Such photons are not coherent. The energy of a solitary photon is insufficient to break the bond between atoms, one of the stages of which is ionization. The photographs registered the rail deformation by 113 cars, while the Gaiger Counter did not. The author's studies show that the cause of damage to a solid is the breakage of bonds between a finite number of atoms due to the stimulated emission of metastable atoms. The guarantee of the reliability of the structure is the ratio of the energy dissipation rate to the energy accumulation rate, but not the strength, which is not a physical parameter since it cannot be measured or calculated. The possibility of continuous control of this ratio is due to the spontaneous emission of photons by metastable atoms. The article presents calculation examples of the destruction of energy and photographs due to the action of photons emitted during the atomic-proton reaction.

Keywords : atomic-proton reaction, precursors of man-made disasters, strain, stress

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