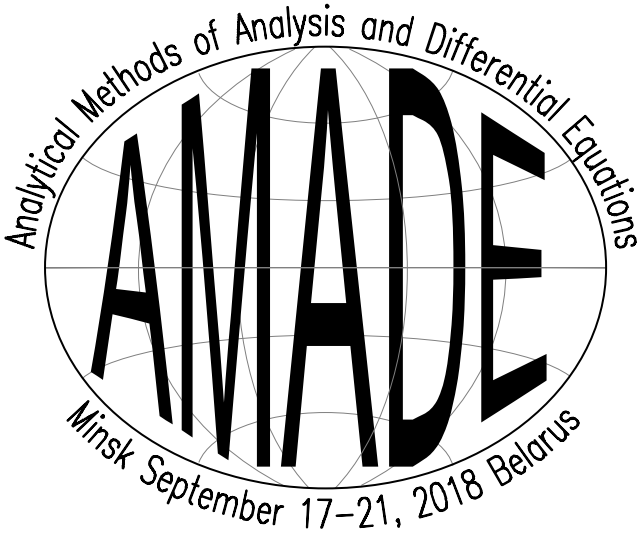
АНАЛИТИЧЕСКИЕ МЕТОДЫ АНАЛИЗА И ДИФФЕРЕНЦИАЛЬНЫХ УРАВНЕНИЙ

ANALYTICAL METHODS OF ANALYSIS AND DIFFERENTIAL EQUATIONS



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TISSUE MIMICKING MATERIALS IN ULTRASONIC HYPERTHERMIA STUDY

E. Kruglenko, R. Tymkiewicz, J. Litniewski, B. Gambin (Warsaw, Poland)

Tissue mimicking materials (TMM) with acoustical properties similar to soft tissue which are stable in the therapeutic temperature range can be used in ultrasonic hyperthermia experiments. Because of thermal stability of agar-gel the TMM based on agar-gel containing micro and nanoparticles were fabricated, [1, 2]. We produced agar-based samples of three types: with addition of magnetic micro and magnetic nanoparticles of 50-100 μm and 50-100 nm, respectively and, with addition of graphite micro particles of diameter $\leq$ 20 μm. In the presentation the influence of adding micro and nano ferrum oxide particles and micro graphite particles on the effectiveness of hyperthermia was studied. The measured acoustic properties of the samples: density, speed of sound, frequency dependent attenuation confirmed the similarities of the acoustic properties to the soft tissue properties, [3]. A series of experiments, in which the focal area located inside the samples were heated by a ultrasonic beam emitted by focused transducer with a central frequency of 2.2MHz were performed. Experimental procedure and set up for precise local samples heating and simultaneous temperature measurement by thermocouples was used, [4, 5]. On the basis of the results, the temperature change rates (TCRs) were calculated. TCR was determined as a derivative of temperature-time increase curve at the initial moment of sonication.

The highest TCR value had the samples with addition of magnetic nanoparticles. This facts underline the unique properties of TMM with magnetic nanoparticles which are the best thermosensitizers among others particles.

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