

7 EPIDEMIC STUDY OF LOW-TEMPERATURE HIGH-VOLTAGE TRANSMISSION ON HEALTH OF HUMANS

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10.1136/jim-2019-000994.7

Background Electromagnetic fields (EMFs) are widely distributed in our environment. The behaviour of organisms in contact with different low-temperature and high-voltage EMFs was compared. It is necessary to investigate the influence of environment EMFs on human health.

Methods We measured the changes in function of the brain, heart and muscle using bioelectromagnetic instruments and methods as well epidemiological investigations in 854 women and men regularly exposed to EMFs. The changes in function were measured using the EGI system 200 Brain electrical information instrument and multi-channel physiological signal system.

Results We found that the strengths of EMFs are depressed by decreasing their height from 6500 V/m and 0.1 G to 350 V/m and 0.01 G. EMFs result in memory loss, distraction, increase in blood fat, chronic diarrhea, anemia and the incidence of hoarseness symptoms. EMFs also depress the incidence of leukopenia and thrombocytopenia.

Conclusion EMFs of low-temperature and high-voltage can change the properties of the images of the brain, as well as heart electrical information.

Acknowledgements This work is supported by Northeast Petroleum University Engagement Fund(py120219); a project grant from the National Natural Science Foundation of China (Grand No. 51474069,51774088), and Post Subsidy Funds for Sci and Tech Achievements of Northeast Petroleum University (HBZZJ201603).

8 THE PREDICTION OF AN ULTRA-LOW TEMPERATURE ONLINE MOTOR MONITORING SYSTEM ON THE SURVIVAL RATE OF LIVING CELLS

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10.1136/jim-2019-000994.8

Background Biological samples and other medical items such as blood and bone marrow need to be kept in an ultra-low temperature environment. A prediction of low-temperature living cell monitoring system was designed, aiming at the current situation of cryogenic temperature.

Methods The system mainly consists of a terminal node, sink node and host computer. By using neural network biofilm, the method predicts the motor speed at the next moment. The terminal node collects the information of the low temperature environment through the sensor and sends the collected information to the sink node regularly. To determine transmission efficiency, the entire system uses a modular structure, based on the scene quickly set up by the application system.

Results The system was tested in a hospital. The test results show that the system, which can measure temperatures between -200°C and -100°C with -0.5° error with high precision and fast response times, and can upload data to the cloud in real time, fully meets the hospital's needs.

Conclusion We studied intelligent control combined with the remote monitoring system of ultra-low temperature freezer and the implementation of each module. The system provides accurate, convenient and reliable results in real time.

Acknowledgements Supported by the project grant from the National Natural Science Foundation of China (51774088) and Post Subsidy Funds for Sci and Tech Achievements of Northeast Petroleum University (HBZZJ201603).

9 DISCRIMINATION OF BREAST TUMORS IN ULTRASONIC IMAGES USING AN ENSEMBLE CLASSIFIER BASED ON TENSORFLOW FRAMEWORK WITH FEATURE SELECTION

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10.1136/jim-2019-000994.9

Background The aim of this study is to use the computer aided diagnostic (CAD) technique to help doctors interpret and diagnose the ultrasound images of mammary glands. CAD technology can reduce doctors' workload, improve objectivity and accuracy of ultrasound breast examination and help further diagnosis and treatment.

Methods This study chose to use the TensorFlow framework to train and predict the neural network. The GPU support version of TensorFlow's Windows platform was selected, and the CUBA toolkit and cuDNN library were used to support the GPU operation.

Results Combined with the convolution neural network algorithm in the field of deep learning, an automatic segmentation method for breast ultrasound images is proposed, which transforms the image segmentation task into the classification task of each pixel in the image.

Conclusion The CAD method can correctly distinguish the tissue area of skin, gland and tumor in breast ultrasound images. The shape and contour are similar to the standard results manually labelled by doctors, and have achieved good results in various quantitative evaluation indexes. In the experiment, the segmentation results generated by different neural network parameter configurations were compared with other methods which showed that the proposed method in this study has certain advantages.

10 WIRELESS LASER TRANSMISSION TECHNOLOGY FOR BIOMEDICAL IMAGE INFORMATION TRANSMISSION

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10.1136/jim-2019-000994.10

Background In the biomedical field, biomedical imaging and X-rays are common techniques, but there has been some damage to medical staff. Wireless laser transmission is the best technology for information transmission between the imaging detector and processing terminal. It can reduce system complexity and human injury.

Methods It is proposed that wireless laser communication technology be used for biomedical imaging. The DFB laser

and EA modulator are integrated. To improve the rate of laser modulation, the modulation model is built, the coupling parameters are optimized, the electrode structure is improved, and the chirp effect is reduced. The laser modulation method is OOK, which uses the signal mixed method to fuse the multi-channel video data from the surgery. The fused data is loaded into the modulator through the driving circuit. The receiver receives and fuses the signal, then constructs the video scene of the operation site.

Results The transmission rate achieved was 2.5Gbps, BER precedes $1E-7$, the transmission delay was less than 1 ms and the four-channel HD video signal was fused.

Conclusions The technology is very suitable for biomedical imaging because the wireless laser communication does not have electromagnetic radiation, promotes good real-time results and does not require laying of a cable.

Acknowledgements Supported by a project grant from Jilin Provincial Science and Technology Department (Grand No.20150204040SF).

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TISSUE VAPORIZATION MECHANISM IN PHOTOSELECTIVE VAPORIZATION OF THE PROSTATE BASED ON EDFA

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10.1136/jim-2019-000994.11

Background To develop a more efficient scheme in photoselective vaporization of the prostate (PVP) with fewer side effects, as well as to determine the critical time of tissue coagulation or vaporization and the degree of thermal damage of the tissue, the tissue vaporization mechanism in photoselective vaporization of the prostate based on EDFA was analyzed.

Methods By comparing the laser vaporization effect of animal liver tissue, muscle tissue and prostate tissue, a laser operation scheme based on EDFA was proposed. The 1064 nm laser is used as the light source, whose power is amplified by EDFA, and the 532 nm laser is obtained by frequency doubling of KTP, which has higher vaporization efficiency and less thermal damage in PVP operation.

Results When the output power of the system is 48.9 W, the frequency is 50 Hz, the pulse width is 5 ms, and the action time is 10 s. In dog prostate samples, the vaporization pit with diameters of 2.0 mm and 3.5 mm, respectively, are produced in aqueous and air conditions, and the thermal damage thickness is 0.4 mm and 0.8 mm.

Conclusion The experimental results show that the establishment of the system is of great significance for the study of the tissue vaporization mechanism and provides a valuable reference for further improvement of PVP operation.

Acknowledgements Supported by a project from Jilin Science and Technology Department (Project No.20170204079GX).

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NEW TWINNING MECHANISM IN HEXAGONAL-CLOSE-PACKED STRUCTURED BIOMATERIALS

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10.1136/jim-2019-000994.12

Background Magnesium and titanium alloys are important biomaterials due to their good biocompatibility. However, the twinning mechanism in them remains obscure.

Methods The lattice structure of $\{10\bar{1}2\}$ twin boundaries in a deformed magnesium alloy was examined by using high-resolution transmission electron microscopy and compared with a previously established model.

Results A type of atomic cluster with a specified structure was discovered to appear at the distorted lattice area of the twin boundary. The orientation of the atomic clusters shows a clear rotation tendency from the parent to the twin.

Conclusion The twinning in hexagonal-close-packed metals was confirmed to be induced by the reorientation of the atomic clusters.

Acknowledgements Supported by the National Natural Science Foundation of China (Grant No. 51301215), Talent Project of Chongqing University of Arts and Sciences (Grant No. R2014CJ04 and 2017RXC24) and the Scientific and Technological Research Program of Chongqing Municipal Education Commission (Grant No. KJ1601117) Chongqing Research Program of Basic Research and Frontier Technology (NO. cstc2017jcyjBX0051 and cstc2014jcyjA50033).

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DESONIDE COMBINED WITH TIMOLOL FOR THE TREATMENT OF SUPERFICIAL INFANTILE HEMANGIOMAS

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10.1136/jim-2019-000994.13

Background To discuss the safety and efficacy of desonide combined with timolol for the treatment of superficial infantile hemangiomas.

Methods From June 2017 to December 2017, 56 infants with superficial hemangiomas were treated by topical application of desonide cream and timolol maleate eyedrops. Patients' clinical data including gender, age, hemangioma position and their changes before and after treatment were retrospectively analyzed. The therapeutic effects were evaluated by two dermatologists at 2 weeks and 3 months after desonide and timolol treatment. The therapeutic effects were rated as: ineffective, the lesion continued growing; partly effective, lesion remission rate $\geq 50\%$ but no complete remission in size, color and texture; effective, the lesion was in complete remission.

Results A total of 56 patients received desonide and timolol treatment, and 20 patients were observed as controls. Two weeks after treatment the hemangioma became softer and smaller. At 3 months, the overall response was ineffective in 3 patients (5.36%), partly effective in 15 (26.79%), and effective in 38 (67.86%), of which 5 patients' hemangiomas had completely disappeared but had a small amount of angiotelectasis. In the control group, the overall response was ineffective in 16 patients (80%), partly effective in 3 (15%), and effective in 1 (5%). The effectiveness and regression rate of the desonide and timolol treated group (94.64%, 67.86%) were significantly better than the control group (20%, 5%) ($p < 0.05$), and no side effects were observed.

Conclusion It is safe and effective to use desonide and timolol to treat superficial infantile hemangiomas.