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R Ravichandra Babu, Mater Sci Nanotechnol 2018, Volume 2

ISO-STRUCTURALITY INDUCED SOLID PHASE TRANSFORMATIONS: A CASE STUDY WITH LENALIDOMIDE

R Ravichandra Babu
Gitam University, India

Comprehensive study for the isolation/characterization on pharmaceutical solids like polymorphs, salts, hydrates, solvates, co-crystals etc. are integral part of pharmaceutical industry. Further the selected solid form should meet the basic requirements of optimal stability, reproducibility and scalability which will eventually lead to devise a robust and reliable process for its manufacture. The existence of more than one crystal structure for a chemical substance is referred as polymorphism. Polymorphs of active pharmaceutical ingredients (API's) have always drawn attention in view of their physical and intellectual property. The importance of polymorph screening can be visualized by a fact of sudden appearance or disappearance of a polymorphic form during manufacturing and storage. These transformations will lead to a series of serious consequences in terms of, patient safety, finance and brand value of the company and so on. The probability of getting polymorphs of an API depends on the conformational flexibility existing in the molecular structure and diversity in the crystal packing. The main objective of the current work was to discover novel polymorphs of LDM and investigate the existence of iso-structurality in them. Thorough investigations were carried out to find the relationship of iso-structurality with de-hydration and de-solvation behavior. In the process of polymorph screening various novel forms along with the reported forms of LDM were isolated and analyzed by various analytical techniques. In the current paper, we have selectively focused on polymorphism, iso-structurality and mechanism of de-solvation/de-hydration in pseudo polymorphs of Lenalidomide.

BIOGRAPHY

R Ravichandra Babu has completed his PhD from Andhra University, Visakhapatnam, India. He is the Director/Professor of Gitam University, India. He had several years of experience in the QA and QC departments of a chemical industry, where he has developed many analytical methods for process related impurities determination. He has over 40 publications and has been serving as an editorial board member of reputed journals.

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MOLYBDENUM IS A FERTILIZER

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Explore the integration of plant growth hormones and chelating vegetation restoration soils contaminated with molybdenum and further assessment of energy crops sunflower heavy-metal contamination of soil remediation operation -cum- related environmental factors intended. By experiment and explore plant growth hormones and heavy metals on the growth scenario explants (explants morphological analysis). The experiment results indicate that GA3 can increase the growth rate of the plant. The average increment of the heavy-metal-added-only group is 21.0 cm; the average increment of the GA3-added group is 21.9 cm; the average increment of the EDDS-added group is 20.3 cm; the average increment of the GA3+EDDS-added group is 21.7 cm. Compared with the conventional methods of phytoremediation, these integrated measures can spur the growth of plants.

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PH-SENSITIVE AMPHIPHILIC POLYPEPTIDE PRODRUG FOR NIR IMAGING-GUIDED COMBINED PHOTODYNAMIC THERAPY AND CHEMOTHERAPY

Zheng Ruan, Pan Yuan and **Lifeng Yan**
University of Science and Technology of China, China

Photodynamic therapy (PDT) is a promising clinical modality for the treatment of tumors and non-malignant nidus. A 4,4-difluoro-4-bora-3a, 4a-diaza-sindacene (BODIPY) core-based photosensitizer (PS) has many of the ideal characteristics of a PDT agent, such as a high extinction coefficient, resistance to photobleaching, and high ratios of light–dark toxicity which could also be recognized as dye for bioimaging. However, the BODIPY mentioned above cannot be dispersed in aqueous solution since it is hydrophobic, and therefore needs a BODIPY-carrier so that the PDT agent can be delivered and then released in the areas of tumors to kill cells. And few researchers have combined chemotherapy using DOX with a photosensitizer which shows great lethality to cancer cells like HepG2 and eminent bioimaging ability. Owing to the significant acidic microenvironments of tumor tissues and low pH (~5.0) inside cancer cells, we have innovatively tried to synthesize hydrazine-based pH-sensitive peptide within PEG shells and entrapped by the novel NIR-BODIPY photosensitizer using DOX for anticancer curing. The integration of chemotherapy and PDT has met the rising necessity of combination for clinical diagnosis. All the polymeric micelles are of suitable size for the EPR effect and can be easily disassembled in an acidic microenvironment to release the DOX or BODIPY for cancer treatment. The polypeptide itself shows great biocompatibility to cells, while severe damage to HepG2 cancer cells was caused by micelles with BODIPY and DOX which have also shown well NIR-imaging ability. All those advantages above mean that dual-agent pH-sensitive polypeptides may be promisingly applied in future medical cures in a combination of PDT and chemotherapy.

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TRANSITION METAL COMPLEXES/ORGANOMETALLIC COMPOUNDS AS ANTICANCER/ANTI-HIV DRUGS OR IN PHARMACEUTICAL INDUSTRY

Prakash MMS Kinthada
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Cancer is a dreadful disease and any practical solution in combating this disease is of paramount importance to public health. Cancer patients have burdened by drug induced toxic side effects, and no turned to seek help from the complementary and alternative medicine hoping for a better cure. Research on platinum-based drugs and non-platinum-based drugs is a Multi-Million Dollar Industry in USA and there is every need to produce safe drugs for the cure of this monstrous disease. Flavonoids have a long history of use in traditional medicines in many cultures. This talk would mainly encompass different transition metal complexes/organometallic compounds that are presently used as drugs, especially anticancer and anti-HIV drugs, apart from anti-inflammatory, antimicrobial, antibacterial and diseases like arthritis and Parkinson's disease etc. This talk would mainly focus on the use of medicinal chemistry and its application to drug design and development in pharmaceutical industry, especially transition metal complexes and organometallic compounds viz. gold, platinum, palladium and ruthenium apart from copper, cobalt, iron, nickel, zinc, cadmium etc. The main emphasis of this talk would be on different class of ligands, their Schiff's bases and transition metal complexes especially Au, Pt, Pd and Ru, with the main aim of designing, developing very novel small molecules, as possible and extremely potential candidates as anti-cancer and anti-HIV drugs. The talk would provide an overview of current programs being undertaken in our laboratories, especially focused on the development of potent ligands capable of recognizing binding sites and diverse strategies employed by my group for elucidation of anti-cancer and anti-HIV drug leads to circumvent the problem caused by cis-platin.

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OBTAINMENT OF TI–AL–C SYSTEM METAL MATRIX COMPOSITES

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The creation of new materials with high physical, mechanical and operational properties, which will ensure the necessary reliability of products in extreme conditions, is relevant for the development of modern technology. Unfortunately, the possibilities of obtaining them using traditional metallurgical methods have been largely exhausted. Therefore, an important challenge facing scientists and engineers is to develop physical principles for the creation of new materials. New materials can be obtained by high-energy preparation of powders and extreme high-speed effects of temperatures and pressures during consolidation by spark-plasma sintering (SPS). Such kind of treatment will allow obtaining materials with higher physico-mechanical properties than those obtained by traditional metallurgical methods. The studies have shown the possibility of creating metal matrix composites strengthened by MAX phases of the Ti-Al-C system by SPS consolidation of the charge after mechanic activation and HVED processing of titanium and aluminum powders in kerosene has been investigated. It is shown that the powder mixture prepared in the course of mechanic activation and the powder mixture obtained in the process of HVED processing in kerosene have a similar granulometric and phase composition and differ only in allotropic forms of carbon in their composition. The effect of allotropic forms of carbon on the formation of new phases in the SPS process is established. Thus, in the mechanically activated charge which contains graphite occurs the formation of the Ti3AlC2 MAX phase, and in the HVED-activated charge that contains C60 and C70 the Ti2AlC MAX phase and the Ti3AlC ternary carbide are formed. It is shown that the metal-matrix composite of the Ti-Al-C system that contains the Ti2AlC MAX phase and the Ti3AlC ternary carbide has a Vickers hardness of 7 GPa, which is almost 2 GPa higher than for the samples that contain the Ti3AlC2 MAX phase (5.1 GPa).

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CHARACTERIZATION AND SENSING PROPERTIES OF ND-DOPED ZNO FILMS

Neha Verma[1,2] and **Sonik Bhatia**[1]

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[2]IKG Punjab Technical University, India

In the present study, we have reported novel, sensing, morphology and optical properties of Neodymium (Nd) doped ZnO nanoparticles using simple combustion method. Herein, different concentrations of Nd (2.0%, 2.5%, 3.0%, 3.5%) were used as dopants. These rod-shaped ZnO nanoparticles were analyzed for x-ray diffraction, FESEM, UV vis spectroscopy, photoluminescence. Characterization studies reveal that the prepared nanoparticles are well crystalline with hexagonal wurtzite structure and are having good optical properties. FESEM images reveals thread type surface morphology of order of 65-90 nm. Optical band gap is obtained from UV vis spectrophotometer and it lies in the range of 3.22-3.31 eV. To develop smart nanoscale devices, ZnO was coated on glass substrate by dip coating technique and were characterized for gas sensing property towards NO_2 gas. These unique nanoparticles also played an important role in detecting host gas due to its contribution in facilitating the transport change and augmenting the adsorption quality of target gas molecules. Interestingly, the sensitivity of the prepared films was found to improve with increase in volume of NO_2 gas concentration from 2-4% and thereafter increase in 5-6% volume of NO_2 gas doesn't lead to any enhancement in gas sensing response. NO_2 gas sensing enhanced significantly at 4% volume of NO_2 gas sensor with response 90.16%. Thus, the optimum concentrations of prepared film (3.0%) are exhibiting maximum response. The prepared films are found to have quick response time 58 sec while the recovery time was 76 sec respectively.

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COPPER AND CADMIUM ESTIMATION IN VARIOUS EXTRACTS OF *PTERIS VITTATA, CATHARANTHUS ROSEUS* AND *GANODERMA LUCIDUM*

M Amin Mir
Uttaranchal University, India

Pteris vittata, Catharanthus roseus and *Ganoderma lucidum* have been analysed for the estimation of copper and cadmium by spectroscopic methods. The two concerned metals have been found within the range of acceptability. Copper and cadmium being acting as a co-enzyme in various metabolic cycles and gets involved in other physiological functions, so needs to be maintained within the range. Since copper and cadmium are both essential cofactors and a toxic element, involving a complex network of metal trafficking pathways, different strategies have evolved in plants to appropriately regulate their homeostasis. The strategies must prevent accumulation of the metals in the freely reactive form (metal detoxification pathways) and ensure proper delivery of these elements to target metalloproteins. The plants and the fungi should be consumed in powder form as to meet the metal deficiency of the body.

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RADIOIODINATION, CHROMATOGRAPHIC SEPARATION AND BIOLOGICAL EVALUATION OF CIMENTIDINE AS A NEW HIGHLY SELECTIVE RADIOTRACER FOR PEPTIC ULCER DISORDER DETECTION

M H Sanad[1], H M Eyssa[2] and H T Salem[3]

[1]Labeled Compounds Department, Radioisotopes Production and Radioactive Sources Division, Egypt
[2]Radiation Chemistry Dept., National Centre for Radiation Research and Technology (NCRRT), Egypt
[3]Health Radiation Research department (Radiodiagnosis Unit), National Center for Radiation Research and Technology, Egypt

Cimentidine has been labeled using [125I] with chloramine-T (Ch-T) or N-Bromosuccinimide (NBS) as different oxidizing agents. Factors such as amount of substrate, reaction temperature, pH, reaction time and, different oxidizing agents have been systematically studied to optimize the iodination. The radiochemical conversion was calculated on thin-layer chromatography (TLC), paper electrophoresis (PC), gel filtration (GF), and then completely purified by high performance liquid chromatography (HPLC). An optimum conversion of 98% was achieved. Biodistribution studies indicate the suitability of [125I]iodocimetidine as a novel tracer to image stomach ulcer. current trends, innovations and methodology in 3D printing. It came up with a theme "Innovations in Medicine through 3D Printing".

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EXTRACTION, SEPARATION AND DETERMINATION OF TETRACYCLINE IN POULTRY USING (HPLC-DAD)

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This research deals with determine the optimal conditions for extraction, separation and determination of tetracycline compound in poultry using high performance liquid chromatography technique with diode array detector (HPLC-DAD). The study shows a good recovery ratio for tetracycline compound 87.50% at the extraction by ultrasonic water bath with a percentage relative standard deviation less than 1% during half an hour. The best recovery ratio for tetracycline compound in poultry 89.55% was recorded using an extraction solvent of McIlvaine-EDTA at pH: 2.6. On the other hand, cartridges solid phase extraction oasis HLB (hydrophilic lipophilic balance copolymer) show a good response for the recovery of tetracycline compound 86.0% from poultry samples at a concentration of 0.1ppm in comparison with other cartridges. The recovery ratio of tetracycline compound doesn´t affected by increasing the volume of methanol used in elution more than 3.5ml. The study mentioned that the hold time needed for the quantitative determination of tetracycline compound from six poultry samples was about three and half hours, which considered as a good time for the application of this method in the control laboratories.

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A SIMPLE ELECTROPHORESIS METHOD FOR THE SIMULTANEOUS DETERMINATION OF CHROMIUM AND VANADIUM AT TRACE LEVELS IN REAL AND ENVIRONMENTAL SAMPLES

M Jamaluddin Ahmed
University of Chittagong, Bangladesh

A very simple, selective and highly sensitive capillary electrophoretic method for the simultaneous determination of chromium (III) and vanadium (V) with Mo(VI)-P(V) reagent has been developed. A Mo(VI)-P(V) reagent reacted with a mixture of trace amounts of chromium (III) and vanadium (V) to form the stable heteropoly anions in 0.1M acetate buffer (pH 2.0) at room temperature (25±50C). Both anionic forms of chromium (III) and vanadium (V) can be determined simultaneously by capillary electrophoresis with direct UV detection at 254-nm. The pre-column complex formation reaction is instantaneous, and absorbance remains stable for 24h. Linear calibration curves were obtained in the concentration ranges of 0.06–60-mgL^{-1} and 0.05–80-mgL^{-1} of Cr(III) and V(V), respectively; the detection limits were 6.0-µg L^{-1} and 5.0-µg L^{-1}, respectively. The influence of several experimental parameters on both sensitivity and efficiency was investigated. The interference from over 50 cations, anions and complexing agents has been investigated at 1-mgL^{-1} of Cr and V, respectively. The unique selectivity and sensitivity of the method allowed its direct application to the determination of Cr and V in complex matrices of certified reference materials and synthetic seawater. The developed was also used successfully in the determination of chromium and vanadium in environmental waters (tap, well and lake). The method has high precision and accuracy (s=±0.02 for 0.5 mg L^{-1}).

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RSM STUDY IN THE FOAM FRACTIONATION OF NATIVE WHEY (WASTE)

Goutam Mukhopadhyay
Maulana Abul Kalam Azad University of Technology, India

The objective of the present study was to optimize the operating conditions in the separation of the total whey proteins from whey by continuous foam fractionation method using response surface methodology (RSM). The effects of the different process variables such as pH (X_1) of proteins in feed, gas flow rate, GFR (X_2) of initial feed solution, protein: surfactant ratio, PSR (X_3) and volumetric flow rate, VFR (X_4) were investigated on the performance criteria of fractionation of raw processed whey. Four factors, three levels Box-Behnken design was used for the optimization procedure. Quadratic model regression equations and response surface plots correlate independent variables (X_1, X_2, X_3 and X_4) and dependent variables (response) such as concentration of foamate (C_f), enrichment ratio (E_r) and percentage recovery ($\%R_p$) of total whey proteins can be achieved easily. All the four factors had significant effects on the response variables. The model predicted that the optimized values of the factors (X_1, X_2, X_3, X_4) were 5, 290, 1.5, 14 respectively. The predicted responses were (concentration of foamate, enrichment ratio, and percentage recovery) such as 6647.32, 13.27, and 78.02 respectively. Experiments were performed with the predicted values of factors.

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USE OF NONOPERATION FOR CURE OF TUMOR AS A SEPARATION TECHNIQUE

Diksha Singh
King George Medical College, India

Ultrasound is an emerging modality for drug delivery in chemotherapy. This poster reviews this novel technology by first introducing the designs and characteristics of three classes of drug/gene vehicles, microbubble (including nanoemulsion), liposomes, and micelles. In comparison to conventional free drug, the targeted drug-release and delivery through vessel wall and interstitial space to cancerous cells can be activated and enhanced under certain sonication conditions. In the acoustic field, there are several reactions of these drug vehicles, including hyperthermia, bubble cavitation, sonoporation and sonodynamics, whose physical properties are illustrated for better understanding of this approach. *In vitro* and *in vivo* results are summarized, and future directions are discussed. Altogether, ultrasound-mediated drug/gene delivery under imaging guidance provides a promising option in cancer treatment with enhanced agent release and site specificity and reduced toxicity. This review poster presents the methodology to treat invasive cancer in a non-invasive manner, by successfully penetrating through the biological membranes.

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ANALYSIS OF MULTI-CLASS CONTAMINANTS IN ENVIRONMENTAL WATER SAMPLES BY FABRIC PHASE SORPTIVE EXTRACTION COUPLED WITH GAS CHROMATOGRAPHY-MASS SPECTROMETRY (FPSE-GCMS)

Ashok Kumar Malik and **Ramandeep Kaur**
Punjabi University, India

A rapid extraction and cleanup method using selective fabric phase sorptive extraction (FPSE) combined with gas chromatography mass spectrometry (GCMS) has been developed and validated for the determination of multi-class contaminants, ethyl paraben (EP), butyl paraben (BP), diethyl phthalate (DEP), dibutyl phthalate (DBP), lidocaine (LIDO), prilocaine (PRI), triclosan (TRI) and bisphenol A (BIS A) in various aqueous samples. Some important parameters such as kind and volume of extraction solvent and extraction time were investigated and optimized. Calibration curves were obtained in the concentration range 0.1-500 ng/mL. Under the optimum conditions the limits of detection (LODs) were in the range 0.029 ng/mL to 0.045 ng/mL. This method was validated by analyzing the compounds in spiked aqueous samples at different levels with recoveries ranged from 83% to 94% and relative standard deviations of less than 10%. The developed method was applied for the determination of the analytes in real tap water, municipal water, ground water, sewage water and sludge water samples. It has great potential in the preconcentration of trace analytes in complex matrix.

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THE CREATURE OF THE NEW EFFECTIVE METHODS MODERNIZATION PRESERVATIVE SOLUTION FOR RED BLOOD CELLS BY MEANS PREPARATIONS OF NANOTECHNOLOGY

Andrey Belousov, Elena Malygon, Vadim Yavorskiy and **Ekateryna Belousova**
Laboratory of Applied Nanotechnology of Belousov, Ukraine

This study was devoted to the learning of the use of nanotechnology to correct the functional activity of red blood cells (RBCs) at the storage stages at a positive temperature. It was established that saline NaCl which had previously been processed by magnetite nanoparticles (ICNB) had a marked membrane-stabilizing effect, inhibits hemolysis and increasing the sedimentation stability of preserved RBCs. The complex analysis of the obtained data allowed to determine the primary mechanisms effect of the saline NaCl which had previously been processed by ICNB on the preserved RBCs. The proposed method of additive modernization of preserved RBCs was adapted to the production process. The optimisation results were obtained in creating a simple and practical method of additive modernization of preservation solutions that does not violate the compliance requirements, improves the quality, efficiency and safety transfusion of RBCs.

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ENANTIO-RESOLUTION OF (+)- BUPROPION BY REVERSED PHASE HIGH PERFORMANCE LIQUID CHROMATOGRAPHY USING CYANURIC CHLORIDE BASED CHIRAL DERIVATIZING REAGENTS HAVING AMINO ACIDS AS CHIRAL AUXILIARIES

Sonika Batra and **Ravi Bhushan**
GD Goenka University, India

Enantio-separation of (+)- bupropion was achieved as its diastereomers which were prepared with chiral derivatizing reagents (CDRs) synthesized from cyanuric chloride. Two sets of CDRs each consisting of five CDRs were prepared by nucleophilic substitution of Cl atom in cyanuric chloride with amino acids (namely, L Leu, L Val, L Phe, D Phg and L Ala) as chiral auxiliaries to give dichloro-s-triazine (DCT) and other five new CDRs were prepared by nucleophilic substitution of Cl atom in 6 butoxy derivative of cyanuric chloride with the above mentioned amino acids. The diastereomers were synthesized under microwave irradiation for 70 or 90s at 80% power and by conventional heating method. Separation of diastereomers was achieved using C_{18} column and an isocratic eluting mixture of acetonitrile and aqueous trifluoroacetic acid. Separation efficiencies of the two sets of CDRs, among themselves and among the two groups, have been compared based on resolution (Rs) and difference between the retention times of resolved diastereomers. The method was validated for detection limit, linearity, accuracy and precision.

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LC-UV METHOD FOR THE DETERMINATION OF FLUDIOXONIL RESIDUE IN RICE GRAINS CULTIVATED IN DIFFERENT REGION OF SINDH AND PUNJAB

Saeeda Nadir Ali, Aneeqa Khalid and Sajid Iqbal
NED University of Engineering and Technology, Pakistan

Present study reports quantitative analysis of fludioxonil residue in rice grains by high performance liquid chromatography with UV-detection. Separation was achieved on a Pruospher® STAR LP (5µm) C18 column at room temperature using mobile phase 50:50 v/v methanol-water (pH 3.3) employing flow rate 1.0 mL min-1. Method was validated following FDA guidelines which showed a very good linear correlation (R2=0.998) within linearity range 0.25 to 16 mg/kg. The lowest limit of detection was found to be 0.0042. Intra-day and inter-day precision were in the range 0.6-1.7 and 0.3-1.3% RSD respectively. Application of the proposed method was confirmed by analyzing fludioxonil residues in rice grains after extraction with methanol:acetone (1:1) and clean-up by acidic alumina:charcoal (1:12) using dichloromethane as the elution solvent. Results showed the concentration of fludioxonil in rice samples collected from the region Badin, Hyderabad, Multan and Lahore was found to be below its MRL level i.e. 0.046 and 0.043, 0.045 and 0.040mg/kg where as its concentration was high in Gularchi and Khanewal samples i.e 0.058 and 0.065 mg/kg respectively. Fludioxonil residue was found to be very low in Sargodha and Jahania samples i.e 0.016 and 0.024 mg/kg respectively and it was not detected in rice sample collected from city Makhdumpur.

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DEMAND FOR BIOGAS: STATE OF ART AND FUTURE PERSPECTIVE

Abdeen Mustafa Omer
Energy Research Institute, UK

Biogas from biomass appears to have potential as an alternative energy source, which is potentially rich in biomass resources. This is an overview of some salient points and perspectives of biogas technology. The current literature is reviewed regarding the ecological, social, cultural and economic impacts of biogas technology. This article gives an overview of present and future use of biomass as an industrial feedstock for production of fuels, chemicals and other materials. However, to be truly competitive in an open market situation, higher value products are required. Results suggest that biogas technology must be encouraged, promoted, invested, implemented, and demonstrated, but especially in remote rural areas.

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