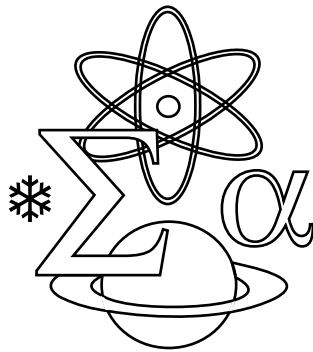


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# CONTENTS

<b>No</b>	<b>Author</b>	<b>Research Papers</b>	<b>Page</b>
1	Ervis TELHAJ Erjona BAKIU Kostandin DOLLANI	Dosimetry of linear accelerator and its use in a treatment planning system: a review	3
2	Ilda MALKUCI Pranvera LAZO Lida PJESHKAZINI	Determination of the trace element selenium in multivitamin preparations by spectrophotometric analysis of slurry samples	13
3	Flora QARRI Sonila KANE Pranvera LAZO	Assessment of trace element pollution around Vlora bay	21
4	Sonila KANE Pranvera LAZO	Assessment of condition of Narta and Oriku lagoons by determination of heavy metals content in water and sediments	33
5	Lirim BEKTESHI Pranvera LAZO Majlinda VASJARI	The study of atmospheric deposition of heavy metal in eastern Albania by moss biomonitoring technique	45
6	Alma EMIRI Elda MARKU	Level of antibiotic residues in albanian aquaculture products	59
7	Adelaida ANDONI	A preparation method for well-defined crystallites of $MgCl_2$ -supported ziegler-natta catalysts, fundamental aspects and the role of electron donors in propylene polymerization	65
8	Arjan KORPA Kledi XHAXHIU Altin MELE Reinhard TRETTIN	Production and characteristics of green bricks from waste siliceous fly ash	79
9	Aida SHKURTI Dhimitër HAXHIMIHALI Ariola DEVOLLI Ismet BEQIRAJ	Study of phosphorus and nitrogen compounds in Bovilla drinking water treatment plant	95
10	Ogerta MANASTIRLIU Pranvera LAZO	Evaluation of heavy metals in Sharra landfill water system in 2012	101
11	Merita XHETANI Yann FICHOU Irena SEFERI Claude FÉREC Grigor ZORAQI	Molecular identification of the foetal <i>rhd</i> gene in alloimmunized rh d-negative mothers	111
12	Ela HOTI, Ledjan MALAJ, Suela KËLLIÇI, Piera Di Martino	Use of DSC and HPLC in assessing nimesulide excipient compatibilities	119
13	Isa HAKLAJ Artan TASHKO	Geochemical signatures of Balkan carboniferous (Juniku, Kosovo) and Middle Triassic (Gashi zone) granitoids geochemical signatures of Balkan carboniferous (Juniku, Kosovo) and Middle Triassic (Gashi zone) granitoids	133
14	Artan HOXHA Altin DORRI	Simulation of a burner operating at mild combustion	153
15	Oltion KORINI Ylber MUÇEKU	Geotechnical evaluation and construction site improvement area of Shëngjini, Albania	165
16		<i>The ore minerals of Albania - a review</i>	179

# **DOSIMETRY OF LINEAR ACCELERATOR AND ITS USE IN A TREATMENT PLANNING SYSTEM: A REVIEW**

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## **ABSTRACT**

The linear accelerator (linac) is the accepted workhorse in radiotherapy. Two medical linear accelerators Elekta Synergy Platform are installed in Hygeia Hospital Tirana for radiotherapy purposes. The high voltage of the linac varies from 6–18 MV. Dosimetry of the beam of X-rays of the two accelerators is performed on a regular basis by the small volumes ionization chambers. The data of the dosimetric measurements enters into a database of an XIO treatment planning system (TPS) and, along with the computed tomography (CT) data, serve as initial data for TPS preparation, carrying out the irradiation process of the target volume with high precision using one or some radiation fields. The results are that 100 monitor units (MUs) produced a dose of 1.009 Gy for a high voltage of 6 MV and 1.004 Gy for a higher voltage of 18 MV, with uncertainty of one percent.

**Key words:** linear accelerator, high energy X-ray beam, ionization chamber, radiotherapy, radiation dosimetry, monitor unit

# DETERMINATION OF THE TRACE ELEMENT SELENIUM IN MULTIVITAMIN PREPARATIONS BY SPECTROPHOTOMETRIC ANALYSIS OF SLURRY SAMPLES

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## ABSTRACT

A simple and low cost spectrophotometric method is applied for selenium (Se) determination in food supplements. In the present investigation, the slurry (0.1–0.2% m/v in 6% v/v HNO<sub>3</sub>) sampling technique was used for Se analysis in multivitamins preparations. The analysis was characterized by good sensitivity and accuracy. The standard addition method, with good performance and a linear calibration graph ( $R^2=0.9996$ ), was applied to avoid interference of the sample matrix in Se determination. Two different food supplements were collected from different pharmacies in Tirana (5 samples for each food supplement). Se concentration per tablet ranged from  $25.38\pm 1.47$ – $54.86\pm 1.36$  µg/tablet. The concentration fell within the range of the concentration reported in the patient information leaflet for both food supplements analysed (25 µg/tablet and 55 µg/tablet). The accuracy of the analysis was checked by recovery of the spikes which was in the range of 97–102%. The method yielded reproducible results with RSD<4.66%.

**Key words:** spectrophotometry, food supplement, selenium concentration, calibration graph, coefficient of linearity

# ASSESSMENT OF TRACE ELEMENT POLLUTION AROUND VLORA BAY

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## ABSTRACT

Recently, environmental assessment consisting of air and seawater investigation has been carried out in Vlora coastal area. Air quality survey involved active biomonitoring, where the moss *Hypnum cupressiforme* was employed as a long-term biomonitoring system. Moss bags were exposed parallel with ditches for six months at nine sites in Vlora, along the main streets. Moss biomonitoring at coastal and inland sites was used for investigation of the distribution of heavy metals in the air. In addition, deposition of anthropogenically mobilized trace metals was investigated. A seawater quality survey was also carried out (see accompanying paper) and determined of heavy metals content in water samples from 15 sites in Narta and Orikumi lagoons and Vlora Bay. Measurements were carried out from April–May 2011 and in February 2012.

Heavy metals (Cu, Pb, Zn, Mn, Fe and Cd) were determined via Atomic Absorption Spectrometry (flame, electrothermal systems). The area studied is moderately polluted as a result of high vehicular emissions and use of adulterated fuel in vehicles. Locations in the city were categorized on the basis of metal concentrations in the mosses and data statistical treatment. Comparison of exposed and unexposed moss helped assess the factors that adulterated the exposed moss samples. Correlation analysis helped determine the geochemically mobile elements and geochemically bound elements.

**Keywords:** active biomonitoring, urban area, seawater, heavy metals, accumulation factor, multivariate analysis, moderately polluted.

# **ASSESSMENT OF CONDITION OF NARTA AND ORIKUM LAGOONS BY DETERMINATION OF HEAVY METALS CONTENT IN WATER AND SEDIMENTS**

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## **ABSTRACT**

Narta and Orikum Lagoons are two of the most important lagoons in Albania, situated in an area of ecological importance. The present paper aims at evaluating their ecological condition via determination of levels of heavy metals in water and sediment samples. Ten samples, four from each lagoon and two comparative samples from the canals that connect each lagoon to the sea, were analysed. Concentrations of Hg, Pb, Cd, Cu, Zn, Cr, Fe, Ni and Mn were determined by means of Atomic Absorption Spectroscopy. Sediments contained a higher level of heavy metals than did water samples, which is to be expected as sediments act as a reservoir for pollutants that in certain circumstances impact water and biota. The high Hg concentrations in lagoon water, particularly in Narta due to the past discharges of industrial waste from a chlorine–alkali plant (now out of work) and the Pashaliman naval base near Orikum, is of great concern. Assessment of water quality was based on quality standards of the Norwegian Institute for Water Research.

**Key words:** heavy metals, pollutant, water, sediment, AAS, chlorine–alkali plant, NIVA

# THE STUDY OF ATMOSPHERIC DEPOSITION OF HEAVY METAL IN EASTERN ALBANIA BY MOSS BIOMONITORING TECHNIQUE

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## ABSTRACT

Biomonitoring issues of air pollution for the environmental evaluation in the eastern Albania are here reported. Mosses possess many properties that make them suitable for monitoring air pollutants (Onianwa 2001; Zechmeister *et al* 2003). Sampling was performed in accordance with the LRTAP convention-ICP protocol and sampling strategy of the European Program on Biomonitoring of HM Atmospheric Deposition. The moss species used as biomonitor was *Hypnum cupressiforme* and was collected at 19 sites distributed over the eastern Albania, in urban and rural zone, in the summer 2011. The location of the sampling sites were determined by GPS and represented by maps. Nineteen elements (Al, As, Ba, Ca, Cd, Cr, Cu, Fe, K, Li, Mg, Mn, Na, Ni, P, Pb, Sr, V, Zn) were determined. ICP technique was used to determine the content of elements in mosses including HM (Al, As, Ba, Ca, Cr, Fe, K, Li, Mg, Mn, Na, Ni, P, Sr, V, Zn). Pb, Cd and Cu were determined by AAS/ETA. The results reveal local emission point. The intensity of metal mean values in moss samples follows the trend  $As < Cd < Li < Pb < V < Cu < Zn < Ni < B < Sr < Mn < Ba < Na < P < Fe < Mg < Al < K < Ca$ . Principal component analysis (factor analysis with VARIMX rotation) was used to identify and characterize different pollution sources and to identify the areas receiving the highest metal pollution load. The data of the factor analysis were applied to distinguish elements mainly of anthropogenic origin from those predominantly originating from natural sources. An additional goal of this study is to complete Albanian map in regard to distribution of HM, identify the main polluted areas and determination of their level in different sites.

**Key word:** *mosses, atomic absorption spectrometry, bio-monitor, heavy metal (HM), factor analysis.*

# LEVEL OF ANTIBIOTIC RESIDUES IN ALBANIAN AQUACULTURE PRODUCTS

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## ABSTRACT

The Albanian aquaculture industry, including the culture of freshwater fish, has expanded rapidly in recent years. Fish and shellfish are a rich source of nutrients and embody a healthy lifestyle. However, like all organisms, aquaculture fish are subject to a large range of diseases, though can be quickly prevented or cured using chemicals or veterinary drugs. No study of the risk presented by antibiotic residues has been conducted in freshwater aquaculture fish in farms and markets in Albania. The present investigation aims at assessing the level of such residues through use of Premi®Test. The results taken from samples obtained in different periods of the year showed that contamination by antibiotic residues occurs only at the farm but does not continue through to the markets, demonstrating that freshwater aquaculture fish from Albania are safe for human consumption.

**Keywords:** aquaculture, veterinary drugs, antibiotic, maximum residue limit (MRL)



# **A PREPARATION METHOD FOR WELL-DEFINED CRYSTALLITES OF $MgCl_2$ -SUPPORTED ZIEGLER-NATTA CATALYSTS, FUNDAMENTAL ASPECTS AND THE ROLE OF ELECTRON DONORS IN PROPYLENE POLYMERIZATION**

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## **ABSTRACT**

An active model for a Ziegler-Natta propylene polymerization catalyst has been prepared by spin coating of a  $MgCl_2$ /donor solution in ethanol on a planar silica wafer, followed by crystal growth by Ostwald ripening to give well-defined  $MgCl_2$ -donor(s)-*n*EtOH crystallites. When a diether donor was used in the crystallites growth only 120° edge angles were formed, indicating formation of a particular crystallite face for the  $MgCl_2$ .

**Keywords:** Ziegler-Natta catalysts, electron donors,  $MgCl_2$  crystallites

# **PRODUCTION AND CHARACTERISTICS OF GREEN BRICKS FROM WASTE SILICEOUS FLY ASH**

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## **ABSTRACT**

In the area of high-pressure technology no additional heating and energy consumption is needed for fly ash to be compacted into bricks. A normal curing makes them as strong as ordinary fired clay bricks. At least 75% fly ash can be used. Nevertheless, the percentage of fly ash in the brick depends on the fly ash characteristics. With proper constituent proportioning and curing, these bricks can reach compressive strengths comparable with those of common clay bricks. Adequately proportioned bricks can reach compressive strengths of the order of 20–30 MPa in laboratory conditions within a few days of curing. A minimum normal water curing period of seven days is of great importance for the bricks to attain high strength. The main parameters that greatly impact the quality of compacted fly ash bricks are; i) the ratio of fly ash (binder) to water, ii) compaction pressure, iii) curing conditions, and iv) the curing time. It appears that there is an optimal composition range and proportioning of constituents for producing the best performing bricks in terms of strength, freeze–thaw durability, mouldability and water absorption characteristics. The bricks produced in this study were uniform in shape with a smooth finish, and were lighter and less porous than ordinary clay bricks.

**Key words:** *green brick production, waste materials, siliceous fly ash, water curing, perforated brick*

# **STUDY OF PHOSPHORUS AND NITROGEN COMPOUNDS IN BOVILLA RESERVOIR AND RIVER TËRKUZA, ALBANIA**

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## **ABSTRACT**

The main sources of nutrient (phosphorus and nitrogen) loading to water include human sewage, cultivated fields, forests, storm water runoff, municipal wastewater treatment, fertilization of crops and livestock manure. It leads to degraded water quality and ecosystem health. The present paper aims at characterizing the parameters controlling water chemistry-such as anthropogenic activity (agriculture, urbanization, point source pollution, and atmospheric deposition). In addition, in the present paper, the impact of geomorphology and biogeographic factors on stressor-water quality relationships is assessed. The tributary of Bovilla reservoir is the Tërkuza River which flows to northeast direction, one of the most important water supplies for Tirana. Water quality characteristics of the reservoir, investigated from May 2002 to December 2010, were a means to address the impact of waste loads on water quality of the river. Concentrations of nutrients (total phosphorus TP, soluble reactive phosphate SRP, total nitrogen, ammonium nitrogen and nitrate+nitrite nitrogen) in the water of the river were analyzed. The results report that the chemical and physical quality of water samples comply with the standard norms for drinking water in Albania.

**Keywords:** water nutrients, organic matter, total phosphorus, ammonium nitrogen, nitrate+nitrite nitrogen

# **USE OF DSC AND HPLC IN ASSESSING NIMESULIDE- EXCIPIENT COMPATIBILITIES**

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## **ABSTRACT**

In the present paper, interactions and compatibilities between nimesulide and some commonly used excipients (Magnesium Stearate-MGST, Lactose Monohydrate and Polyvinylpyrrolidone-PVP) are investigated by means of two techniques: the Differential Scanning Calorimetry (DSC) and High Performance Liquid Chromatography (HPLC). The properties of the pure compound untreated or technologically processed (co-ground, kneaded or tableted), were compared with those of binary mixtures nimesulide-exciipient, which underwent the same treatment. DSC and HPLC were used to examine indications of interactions within the mixtures, hence potential incompatibilities.

*Keywords:* Nimesulide, DSC, HPLC, drug-exciipient.

# **SIMULATION OF A BURNER OPERATING AT MILD COMBUSTION<sup>1</sup>**

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## **ABSTRACT**

A combustor with high air preheating and strong internal exhaust gas recirculation is numerically simulated. The combustor operates in the mild combustion mode, characterized by relatively low flame temperatures, low NO<sub>x</sub> emissions, no visible flame and no sound. A computational fluid dynamics (CFD) model is set up comprising the input of geometrical model, mesh-refining process, setting up physical model, handling of algorithms of solution, and the incorporation of appropriate user subroutine that was linked to the fluent code. Predictions of the mean velocity components are compared with experimental data. It is found that the predicted profiles reproduce the data reasonably well, but some small discrepancies were found. It is found that the calculated temperatures reproduce experimental data reasonably well. Predictions of the mass fraction of CO<sub>2</sub>, mass fraction of H<sub>2</sub>O, turbulent kinetic energy, turbulent dissipation rate are found.

**Key Words:** MILD combustion; Flameless Burner; CFD

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<sup>1</sup> This work was performed during a sabbatical leave of A. Hoxha at the ITU, Istanbul Technical University in Turkey

# GEOTECHNICAL EVALUATION AND CONSTRUCTIONS SITE IMPROVEMENT IN AREA OF SHËNGJINI, ALBANIA

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## ABSTRACT

The present investigation aims at finding appropriate solution to the geotechnical issues associated to the construction industry in the area of Shëngjin where more than 50 percent of the surface area comprises peat soils characterized by extremely low bearing capacity. The area is one of the most attractive coastal zones in Albania, and is considered a top priority tourism destination. Using soil compaction in medium loose soil and geotextiles for this peaty area is appropriate. In the present investigation, geotextiles helped stabilize and separate the fill from the basement of a very porous lithological environment such as the peat soils. Results obtained via field work and geotechnical investigation found that the underground water table is close to the surface (0.1–0.2m). In the area of soil reinforcement, steep slopes, roadway bases and foundation soils, application of geogrids are appropriate: plastic materials, often reinforced with glass fibre, are able to carry considerable tensile loads. This method has found wide and successful application in ground stabilization cases, and is recommended for constructions in the area of Shëngjin.

**Keywords:** physical and mechanical properties, geotechnical evaluation, soft soils, site improvement, foundation's calculation, finite element method, software plaxis.