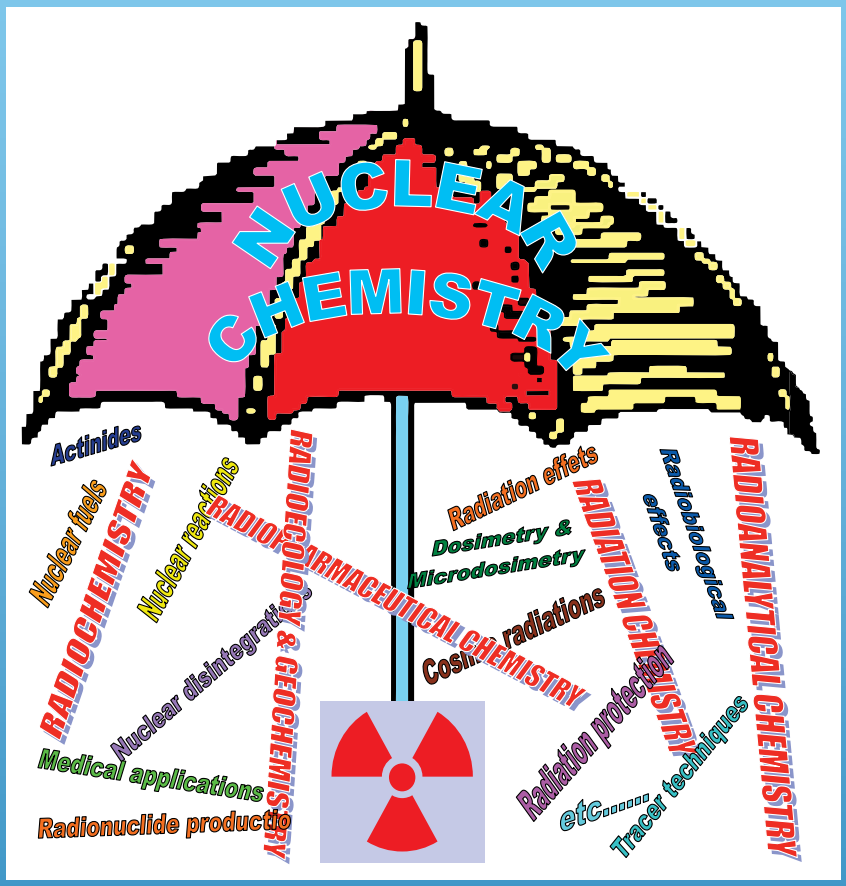
4th-INCC

4th International Nuclear Chemistry Congress
14 – 19 September 2014, Maresias, São Paulo, Brazil



Program
Abstract Book

Edited by

Marina B. A. VASCONCELLOS

SUMMARY

Committee 06

Promotion and Sponsors 07

General Information 08

Program 10

Invited Speakers 12

Detailed Program 14

Poster Session 18

Abstracts 31

- Invited Speakers 33
- Oral Session 45
- Poster Session 119

COMMITTEE

Chair:

Marina Beatriz Agostini Vasconcellos | IPEN - CNEN/SP

Co-Chair:

Turan Ünak | Emeritus of Ege University, Izmir, Turkey
President of the International Nuclear Chemistry Society

Local Committee:

Ana Maria Graciano Figueiredo | IPEN - CNEN/SP
Casimiro J. S. Munita | IPEN- CNEN/SP
Déborah I. T. Fávaro | IPEN - CNEN/SP
Edson Gonçalves Moreira | IPEN - CNEN/SP
Maria José Armelin | IPEN - CNEN/SP
Mitiko Saiki | IPEN - CNEN/SP
Paulo S. Cardoso da Silva | IPEN - CNEN/SP
Vera Akiko Maihara | IPEN - CNEN/SP
Almir Faria Clain | IRD - CNEN/RJ
Barbara Mazzilli | IPEN - CNEN/SP
Elvis Joacir de França | CRCN/NE/PE
Maria Ângela de Menezes | CDTN - CNEN/MG

International Scientific Board:

Aleksander Bilewicz | Poland
Amares Chatt | Canada
Boris L. Zhuikov | Russia
Borut Smodis | Slovenia
Chai Zhifang | China
Eduardo Cortes Toro | Chile
Flavia Groppi | Italy
James D. Â Navratil | USA
João Osso Junior | Austria
Kattesh V. Katti | USA
Manuel Navarrete | Mexico
Maria do Carmo Freitas | Portugal
Maria Helena Sampa | Brazil
Mathias Rossbach | Germany
Namik K. Aras | Turkey
Panagiotis Misaelides | Greece
Rita Pla | Argentina
Robert Parr | Austria
Rolf Zeisler | USA
Simon Jerome | UK
Suresh K. Aggarwal | India
Tibor Braun | Hungary
Turan Ünak | Turkey
Xiaolin Hou | Denmark

POSTER SESSION 1 - SEP 16 | Tuesday

EDUCATION IN NUCLEAR CHEMISTRY

NEUTRON ACTIVATION ANALYSIS AND ITS APPLICATION TO DETERMINE THE CONCENTRATION OF ELEMENTS IN COMPLEX MATRICES
Valerian LOBO[1], [1]Wollo University 123

KNOWLEDGE ABOUT NUCLEAR ENERGY AND RADIOACTIVITY OF SENIOR HIGH SCHOOL STUDENTS
Aline Sabastiane Gonçales Ramos de OLIVEIRA[1], Lucio LEONARDO[1-2], Sandra Regina DAMATTO[1], [1]Laboratório de Radiometria Ambiental - Instituto de Pesquisas Energéticas e Nucleares (IPEN / CNEN) São Paulo, SP, [2] Universidade Paulista - UNIP 124

NUCLEAR AND RADIOCHEMISTRY

MECHANISM OF $UO_2(NO_3)_2 \times 6H_2O$ DECOMPOSITION UNDER MICROWAVE IRRADIATION
Sergey A. KULYUKHIN[1] , [1]Institute of Physical Chemistry and Electrochemistry, Russian Academy of Science 127

SORPTION OF UO_2^{2+} ON SORBENTS BASED ON MODIFIED SILICA GEL CONTAINING Cu, Ni, AND Zn FROM AQUEOUS SOLUTIONS
Sergey A. KULYUKHIN[1], Margarita P. GORBACHEVA[1] , [1]Frumkin Institute of Physical Chemistry and Electrochemistry, Russian Academy of Science 128

FORMATION OF NITROGEN OXIDES DURING URANIUM NITRIDE DISSOLUTION IN NITRIC ACID
Alexei A. BESSONOV[1], Sergey A. KULYUKHIN[2], Andrey Yu. SHADRIN[3], Yulia A. VOSKRESENSKAYA[4], Oleg A. USTINOV[5] , [1]Frumkin Institute of Physical Chemistry and Electrochemistry, Russian Academy of Science, [2]IOpen joint-stock company VNIINM 129

ABSORPTION OF NITROUS OXIDE IN AQUEOUS SOLUTIONS OF GAS CLEANING SYSTEM IN TECHNOLOGICAL SCHEMES OF UN DISSOLUTION
Sergey A. KULYUKHIN[1], Andrey Yu. SHADRIN[2], Alexei A. BESSONOV[1], Yulia A. VOSKRESENSKAYA[2], Oleg A. USTINOV[2], [1]Frumkin Institute of Physical Chemistry and Electrochemistry, Russian Academy of Science, [2]IOpen joint-stock company VNIINM 131

Np(V)-PHENANTHROLINE-DiCARBOXYLIC ACID COMPOUNDS: SYNTHESIS, STRUCTURE, PROPERTIES
Alexei A. BESSONOV[1], A.B. YUSOV[1], I. A. CHARUSHNIKOVA[1], A. M. FEDOSSEEV[1], [1]Frumkin Institute of Physical Chemistry and Electrochemistry, Russian Academy of Sciences 133

URANYL NITRATE HYDROLYTIC BEHAVIOR IN THE PRESENCE OF REDUCTANT
Alexei A. BESSONOV[1], A.M. FEDOSSEEV[1], Y.M. KULYAKO[2], S.A. PEREVALOV[2], A.Yu. SHADRIN[3] , [1]Frumkin Institute of Physical Chemistry and Electrochemistry of RAS, [2]Vernadsky Institute of Geochemistry and Analytical Chemistry of RAS, [3]Open joint-stock company VNIINM 134

NUCLEAR AND RELATED TECHNIQUES

CRYSTALLINE STRUCTURE AND OXYGEN STOICHIOMETRY OF THE $Ba_{0.50}Sr_{0.50}Co_{0.80}Fe_{0.20}O_{3-\delta}$ POWDERS OBTAINED BY EDTA-CITRATE METHOD MEASURED BY X-RAY AND NEUTRON DIFFRACTION
Everton BONTURIM[1], Nelson Batista de LIMA[1], Vera Lúcia MAZZOCCHI[1], Carlos Benedicto Ramos PARENTE[1], José MESTNIK FILHO[1], Emília Satoshi Miyamaru SEO[1], [1]Instituto de Pesquisas Energéticas e Nucleares IPEN-CNEN/SP 137

EVALUATION OF A ^{99m}Tc COMPLEX AS AN OIL MULTIPHASE RADIOTRACER
Martha Sahylí Ortega PIJEIRA[1], Judith DOMÍNGUEZ[1], Jorge L. BATISTA[1], Yuniel TEJEDA[1], Ernesto Martínez BAEZ[1], Jorge Borroto PORTELA[1], [1]Department of Radiochemistry, High Institute of Applied Sciences and Technologies 138

VARIATIONS ON UO_2-DOPED AND UNDOPED FUEL PELLETS MICROSTRUCTURES BY THE ADDITION OF RECYCLED MATERIAL
Diogo Ribeiro COSTA[1], Franciole José EZEQUIEL[1], Rodrigo Aparecido BARBOSA[1], João Paulo Rodrigues CARNAVAL[1], [1] Brazilian Nuclear Industries (Indústrias Nucleares do Brasil S.A.– INB) 139

HETEROGENEITY EVALUATION OF UO_2 PELLETS TO BE USED IN A BRAZILIAN MEASUREMENTS SYSTEMS INTERCOMPARISON PROGRAMS
Bárbara Fernandes Gonçalves CRISTIANO[1], José Ubiratan DELGADO[1], José Wanderley S. da SILVA[1], Aline Gonzalez VIANA[1], Fábio Cordeiro DIAS[1], Marcos Sodre GRUND[1], Ricardo Tadeu LOPES[1], [1]Comissão Nacional de Energia Nuclear (CNEN), Instituto de Radioproteção e Dosimetria (IRD/CNEN) .. 140

CONCEPTION AND CONSTRUCTION OF A REMOTE PROBE FOR A PORTABLE SPECTROMETER USING THE ENERGY DISPERSIVE X-RAY FLUORESCENCE TECNIQUE
Francisco Antonio BRANDÃO Junior[1-2], Arno Heeren de OLIVEIRA[1], Antonella LOMBARDI Costa[1], [1]Departamento de Engenharia Nuclear, Universidade Federal de Minas Gerais, [2]Centro Federal de Educação Tecnológica de Minas Gerais (CEFETMG) 141

MAJOR ELEMENTAL FEATURES OF A PORTUGUESE BREAD-WHEAT ARCHIVAL COLLECTION, DETERMINED BY INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS
Catarina Isabel Alves Lourenço GALINHA[1-2-4], Adriano M. G. PACHECO[2], Maria do Carmo FREITAS[1], Ana R. P. COSTA[3], Nuno M. B. PINHEIRO[3], Benvindo MAÇÃS[3], Ana Sofia ALMEIDA[3], Hubert T. WOLTERBEEK[4], [1]URSN/CTN-IST, University of Lisbon, [2]CERENA-IST, University of Lisbon, [3]INIAV, National Institute of Agricultural and Veterinary Research, Savavém, [4]Department of Radiation Science and Technology, Faculty of Applied Sciences, Delft University of Technology Portugal 177

RADIATION CHEMISTRY

IMPROVEMENT IN THE RADIATION STABILITY OF EPDM/INCORPORATED EPDM POWDER/CARBON BLACK COMPOUND
Ludmila de Ysasa Pozzo KIYAN[1], Traian ZAHARESCU[2], Duclerc Fernandes PARRA[1], Ademar Benévolo LUGÃO[1], [1]IPEN, Center of Chemistry and Environment, [2]INCDIE ICPE CA, Department of Advanced Materials 181

SIMULTANEOUS USE OF ANION EXCHANGER AND SR RESIN FOR EFFICIENT STRONTIUM ISOLATION FROM COMPLEX MATRICES
Gorana KARANOVIĆ[1], Ivana MILANOVIĆ[1], Željko GRAHEK[1], [1]Ruđer Bošković Institute 182

EVALUATION OF PHYSICO-CHEMICAL PROPERTIES AND BIODEGRADATION OF POLYMERIC MEMBRANES BASED CHITOSANA, STARCH, AND POLYVINYLPYRROLIDONE (PVP) SYNTHESIZED BY GAMMA RADIATION AT DIFFERENT DOSES AND DOSE RATES
Jorge Gabriel dos Santos BATISTA[1], Ana Carolina Moreira FONSECA[2], Ademar Benévolo LUGÃO[3], [1]Instituto de Pesquisas Energéticas e Nucleares (IPEN / CNEN - SP) 183

EFFECT OF γ-IRRADIATION ON RADICAL SCAVENGING, REDUCING POWER AND LIPID PEROXIDATION INHIBITION PROPERTIES OF HYDROALCOHOLIC EXTRACTS FROM *MALVA NEGLECTA*
José Virgílio Santulhão PINELA[1-2], Amilcar L. ANTONIO[1-3], Lillian Bouçada de BARROS[1], Ana M. CARVALHO[1], M. Beatriz P. P. OLIVEIRA[2], Isabel C. F. R. FERREIRA[1], [1]Centro de Investigação de Montanha (CIMO), ESA, Instituto Politécnico de Bragança, [2]REQUIMTE/Departamento de Ciências Químicas, Faculdade de Farmácia, Universidade do Porto, [3]Centro de Ciências e Tecnologias Nucleares, IST, Universidade de Lisboa 184

ANALYSIS OF PHENOLIC COMPOUNDS IN *Tropaeolum majus* L. PROCESSED BY IONIZING RADIATION
Amanda Cristina Ramos KOIKE[1-2], João C. M. BARREIRA[2], Lillian BARROS[2], Celestino SANTOS-BUELGA[3], Anna Lucia C. H. VILLAVICENCIO[1], Isabel C. F. R. FERREIRA[2], [1]Instituto de Pesquisas Energéticas e Nucleares (IPEN - CNEN/SP), [2]Centro de Investigação de Montanha (CIMO), ESA, Instituto Politécnico de Bragança, [3]Grupo de Investigación en Polifenoles (GIP-USAL), Faculty of Pharmacy, University of Salamanca 185

IMPACT OF GAMMA IRRADIATION ON CHEMICAL COMPOSITION OF *MELISSA OFFICINALIS* L.
Eliana PEREIRA[1-2], Amanda Cristina Ramos KOIKE[3], Amilcar L. ANTONIO[1-4], Lillian BARROS[1], Isabel C. F. R. FERREIRA[1], [1]Mountain Research Centre (CIMO), ESA, Polytechnic Institute of Bragança, [2]GIP-USAL, Faculty of Pharmacy, University of Salamanca, [3]Instituto de Pesquisas Energéticas e Nucleares (IPEN/CNEN-SP), [4]Centro de Ciências e Tecnologias Nucleares, IST, Universidade de Lisboa 186

INFLUENCE OF ANTIOXIDANT LOADING ON THE γ-EXPOSURE OF ETHYLENE-PROPYLENE TERPOLYMER
Heloísa Augusto ZEN[1], Traian ZAHARESCU[2], Mariana Mădălina MARINESCU[2], Sandra Regina SCAGLIUSI[1], Elizabeth Carvalho Leite CARDOSO[1], Ademar Benevolo LUGÃO[1], [1]IPEN, Center of Chemistry and Environment, [2]INCDIE ICPE CA, Department of Advanced Materials 187

THERMAL RESISTANCE OF EPDM/IIR SYSTEMS UNDER γ-IRRADIATION
Sandra Regina SCAGLIUSI[1], Traian ZAHARESCU[2], Heloísa Augusto ZEN[1], Elizabeth Leite Carvalho CARDOSO[1], Silviu JIPA[3], Ademar Benévolo LUGÃO[1], [1]IPEN, Center of Chemistry and Environment, [2]INCDIE ICPE CA, Department of Advanced Materials, [3]University of Valachia, Faculty of Science and Arts 188

RADIOECOLOGICAL AND GEOCHEMISTRY

RN-222 AND STABLE ISOTOPES AS A NATURAL TRACER IN GROUNDWATER-SURFACE WATER INTERACTIONS AT THE ARTIFICIAL RECHARGE SYSTEM
Yoon Yeol YOON[1], Kil Yong LEE[1], Soo Young CHO[1], Kyu Chul HA[1], [1]Geologic Environment Division, Korea Institute of Geoscience and Mineral Resources (KIGAM) 191

THE CONTRIBUTION OF MINING ACTIVITIES ON ANTHROPOGENIC INPUT OF Cu, Pb AND Zn IN THE CANANÉIA-IGUAPE SYSTEM
Keila Modesto TRAMONTE[1], Paulo Alves de Lima FERREIRA[1], Andreza Portella RIBEIRO[1-2], Rubens César Lopes FIGUEIRA[1], Michel Michaelovitch de MAHIQUES[1], [1]Instituto Oceanográfico da Universidade de São Paulo, [2]Universidade Nove de Julho (UNINOVE), Mestrado de Gestão Ambiental e Sustentabilidade 192

SEDIMENTATION PROCESSES IN THE SEMI-ENCLOSED BAY DEDUCED FROM VERTICAL PROFILES OF ^{137}CS MASSIC ACTIVITIES (KAŠTELA BAY, ADRIATIC SEA, CROATIA)
Ivanka Lovrenčić MIKELIC[1], Višnja OREŠČANIN[2], Krunoslav ŠKARO[3], Delko BARIŠIĆ[1], [1]Laboratory for Radioecology, Division for Marine and Environmental Research, Ruđer Bošković Institute, [2]Advanced Energy Ltd, [3]Hydrographic Institute of the Republic of Croatia, Oceanographic Department 193

STATISCAL ANALISYS OF DISCREPANTS RADIOECOLOGICAL DATA USING MONTE CARLO BOOTSTRAP METHOD
Arykerne Nascimento Casado da SILVA[1], Romilton dos Santos AMARAL[1], José Wilson VIEIRA[1], José Araújo dos SANTOS Júnior[1], [1]Nuclear Energy Department of Federal University of Pernambuco 194

A 10-YEAR RECORD OF SEASONAL VARIATION OF ^{7}BE IN PARTICULATE MATTER AND PLANTS OF CERRADO BIOME, BRAZIL
Bruno Burini Robles ARINE[1], Marco Antonio Proença Vieira MORAES[1], André Luis Lima de ARAÚJO[1], [1]Centro Tecnológico da Marinha em São Paulo - Laboratório Radioecológico 195

IMPACT OF GAMMA IRRADIATION ON CHEMICAL COMPOSITION OF *MELISSA OFFICINALIS* L.

Eliana PEREIRA[1-2], Amanda Cristina Ramos KOIKE[3], Amilcar L. ANTONIO[1-4], Lillian BARROS[1], Isabel C. F. R. FERREIRA[1]

[1]Mountain Research Centre (CIMO), ESA, Polytechnic Institute of Bragança, [2]GIP-USAL, Faculty of Pharmacy, University of Salamanca, [3]Instituto de Pesquisas Energéticas e Nucleares (IPEN/CNEN-SP), [4]Centro de Ciências e Tecnologias Nucleares, IST, Universidade de Lisboa, São Paulo, Brazil, iferreira@ipb.pt

Food irradiation is increasingly recognized as an effective decontamination technique that ensures the chemical and organoleptic quality of the product. This decontamination method leads to a reduction in the application of chemical fumigants and preservatives, which are currently used by the food industry in order to provide higher safety for the consumer since it does not leave chemical residues in food. *Melissa officinalis* L. (commonly known as lemon balm) is used in several countries as aromatic, medicinal herb and also for culinary use. Traditionally it is consumed in infusions for various disorders such as headaches, gastrointestinal disorders (flatulence cramps, spasms and indigestion), nausea, nervousness, anemia, vertigo, syncope, malaise, asthma, bronchitis, amenorrhea, heart failure, arrhythmia, insomnia, epilepsy, depression, psychosis, hysteria, ulcers and wounds; it is also used as anti-bacterial [1-3]. The aim of the present work was to evaluate the effects of different doses of gamma irradiation (0 kGy – control, 1 kGy and 10 kGy) on nutritional value and chemical composition of *M. officinalis*. The nutritional value was determined according to official analysis procedures. The composition in free sugars, fatty acids and tocopherols was determined by high performance liquid chromatography-refraction index detection (HPLC-RI), gas chromatography-flame ionization detection (GC-FID), and HPLC-fluorescence, respectively. According to the results obtained this decontamination process has not modified the concentration of fructose and glucose; the dose of 1 kGy protected the concentration of α- and γ-tocopherol, sucrose, and macronutrients, with exception of carbohydrates. In general, 10 kGy protected sucrose, threalose, oxalic, quinic and malic acids, and γ- and δ- tocopherols level. Overall, irradiation might represent a suitable solution for *M. officinalis* postharvest treatment, since the doses of 1 and 10 kGy preserved various chemical compounds and the nutritional of the studied plant.

Keywords: *Melissa officinalis* L.; food irradiation; chemical composition

Acknowledgments: The authors are grateful to Fundação para a Ciência e a Tecnologia (FCT, Portugal) for financial support to CIMO (strategic project PEst-OE/AGR/UI0690/2011). The authors are also grateful to "MaisErvas - Aromáticas e Medicinais" for samples providing.

REFERENCES

1) K. Dastmalchi, H.J. Damien Dorman, P.P. Oinonen, Y. Darwis, I. Laakso, R. Hiltunen, LWT 41 (2008) 391-400.
2) C. Weitzel, M. Petersen, Phytochem. 72 (2011) 572-578.
3) H.B. Owczarczyka, W. Migdal, B. Kędzia, Radiat. Phys. Chem. 57 (2000) 331-335.