AIZ-CIS-GIC Jointly Meeting 2019, 11th - 14th June, 2019

BOOK OF FULL ABSTRACTS

Jointly Meeting of the
Italian Zeolite Association (AIZ)
Czech-Italian-Spanish (CIS) Conference
Italian Interdivisional Catalysis Group (GIC)

XVI National Congress of Zeolites Science and Technology

8th Czech-Italian Spanish Conference on Molecular Sieves and Catalysis

XXI National Congress of Catalysis

Chairs

Prof. CRUCIANI Giuseppe	University of Ferrara, Italy
Prof. MARTUCCI Annalisa	University of Ferrara, Italy

Organizing Committee

Prof. CRUCIANI Giuseppe	University of Ferrara, Italy
Prof. MARTUCCI Annalisa	University of Ferrara, Italy
Prof. MIGLIORI Massimo	University of Calabria, Italy
Prof. GIORDANO Girolamo	University of Calabria, Italy
Dr. MILLINI Roberto	ENI SpA, Italy
Dr. POLLESEL Paolo	ENI SpA, Italy

Scientific Committee

Prof. CAVANI Fabrizio	University of Bologna, Italy
Prof. ČEIKA Jiří	J. Heyrovsky ICP, Prague, Czech Republic
Prof. CENTI Gabriele	University of Messina, Italy
Prof. GATTA G. Diego	University of Milano, Italy
Dr. HORÁČEK Michal	J. Heyrovsky ICP, Prague, Czech Republic
Prof. MARTÍN-ARANDA Rosa María	UNED, Madrid, Spain
Prof. NACHTIGALL Petr	Charles University Prague, Czech Republic
Prof. OPANASENKO Maksym	J. Heyrovsky ICP, Prague, Czech Republic
Prof. PÉREZ-PARIENTE Joaquin	CSIC-ICP, Madrid, Spain
Dr. PSARO Rinaldo	CNR-INSTM, Italy
Prof. REY GARCÍA Fernando	ITQ-UPV, Valencia, Spain
Prof. SERRANO David P.	Rey Juan Carlos University, Madrid, Spain

Book of Abstracts

Dr. ARDIT Matteo (Editing)	University of Ferrara, Italy
Dr. RODEGHERO Elisa (Editing)	University of Ferrara, Italy
Prof. MARTUCCI Annalisa (Cover)	University of Ferrara, Italy

SILVER SPONSORS

Complementary package in race pack courtesy of

CIS-TRANS3 "run map"

PROGRAM

TUESDAY, 11TH JUNE	
14:30-16:00	Registration
16.00-16:30	Opening
16:30-17:15	PL1 - Giuseppe Bellussi: The energy transition towards a zero emission energy supply system (Chair: Girolamo Giordano)
17:15-18:15	Session Tu-1
17:15-17:35	O1 - PÉREZ-BOTELLA: Influence of zeolite framework topology in the CO_2/CH_4 separation
17:35-17:55	O2 - GARBARINO: On the role of La_2O_3 and SiO_2 in the formulation of Ni/Al_2O_3 based CO_2 methanation catalysts
17:55-18:15	O3 - NACHTIGALL: Fast room temperature lability of aluminosilicate zeolites
18:15-18:55	Award's talks (Chairs: Giuseppe Cruciani and Fabrizio Cavani)
18:15-18:35	Premio Gottardi 2019 - CAMPANILE: Facile synthesis of nanostructured cobalt pigments by Co-A zeolite thermal conversion and its application in porcelain manufacture
18:35-18:55	Premio Parmaliana 2019 - FIORENZA: Modified TiO_2-based catalysts for energy production and environmental protection
18:55-19.30	IL1 - Carlo Perego: Giuseppe Bellussi and zeolite science: a long history of success
20:00	Welcome Party

WEDNESDAY, 12TH JUNE		
8:30-9:15	PL2 - Jiří Čejka: Adorable zeolites and catalysts (Chair: David Serrano)	
9:20-10:40	Session We-1a (Chair: Domenico Caputo)	Session We-1b (Chair: Matteo Guidotti)
09:20-9:40	O4 - PAPANIKOLAU: Effect of a mild NH_4OH treatment on local structure and acidic sites distribution of Fe-MFI	O7 - BENSAID: Aqueous phase reforming of sugar-based biorefinery streams: from the simplicity of model compounds to the complexity of real feeds
9:40-10:00	O5 - MARTÍNEZ ORTIGOSA: Silicalite synthesized by the dual-template technique: a solid state NMR study	O8 - PAONE: Comparing batch and gas-flow conditions in the transfer hydrogenation of alkyl levulinates promoted by ZrO_2 catalyst
10:00-10:20	O6 - ZANARDI: Crystalline hybrid organic-inorganic gallosilicates: synthesis and crystal structure	O9 - TABANELLI: Glycerol carbonates as an innovative alkylating agents for phenolics
10:20-10:30	SO1 - PATEROVA: Use of Lewis and Brønsted acids as catalysts for β-pinene oxide rearrangement to prepare myrtenol and myrtanal	SO3 - MALARA: Transfer hydrogenolysis of aromatic ethers promoted by Pd/Fe3O4 electrospun nanomaterials
10:30-10:40	SO2 - SAJAD: Catalytic activity of noble metal clusters encapsulated in zeolites	SO4 - PASSALACQUA: Cyclic voltammetric studies of small iridium clusters for energy carrying molecules
10:40-11:00	Coffee Break	
11:00-13:00	Session We-2a (Chair: Giovanna Vezzalini)	Session We-2b (Chair: Michela Signoretto)
11:00-11:20	O10 - ALONSO-DONCEL: Tuning mesoporosity in hierarchical ZSM-5 zeolite by changing the silanization agent functionality	O15 - BONELLI: Reverse micelles sol-gel synthesis allows both bulk doping and heteroatoms surface enrichment in Mo-doped TiO_2 nanoparticles
11:20-11:40	O11 - FABBIANI: Polymerization of hexadiene and phenylacetylene confined in silica zeolite channels	O16 - GUIDOTTI: Copper-containing microporous molecular sieves and organically modified clays applied in the defence against the olive tree fly pest
11:40-12:00	O12 - CAMETTI: Structural modifications and thermal stability of Cd^{+2}-exchanged stellerite, a zeolite with STI framework type	O17 - SANTACESARIA: Preparation of nanostructured catalysts by grafting metal alkoxides on the surface of oxides supports
12:00-12:20	O13 - COMBONI: High-pressure cold methanol intrusion in MFI-zeolites	O18 - STUCCHI: Post-synthesis modification of gold-silver nanoparticles: a way to tune catalytic activity and selectivity
12:20-12:40	O14 - KUBŮ: Encapsulation of metal nanoparticles (NPs) within zeolite frameworks via 2D to 3D transformation	O19 - Mino: Photocatalysis on shape-engineered TiO_2 nanoparticles: a closer look into the surface processes by in situ spectroscopies
12:40-12:50	SO5 - ERIGONI: Synthesis and characterization of organosiliceous hybrid materials containing acid functionalities	SO7 - ARMANDI: Amphoteric surfaces stemming from the partial collapse of hybrid aluminosilicate nanotubes: an IR spectroscopy assessment
12:50-13:00	SO6 - LEO: Direct α-arylation of ketones efficiently catalyzed by Cu-MOF-74	SO8 - CAVUOTO: Synthesis of biosurfactants by solid acid catalysts
13:00-14:00	Lunch	
14:00-15:30	Free Time	
15:30-17:10	Session We-3 (Chair: Joaquin Pèrez Pariente)	
15:30-15:40	SO9 - YUE: Multiple phase transformations during the synthesis of germanosilicate UOS	
15:40-15:50	SO10 - BELVISO: Synthetic zeolite and laser effect: preliminary data	
15:50-16.00	SO11 - ARDIT: The ferroelastic phase transition in ZSM-5 zeolites: chemistry vs. thermodynamic	
16:00-16:20	O20 - BONURA: The key role of metal-zeolite interaction for stability of hybrid catalysts during CO_2-to-DME hydrogenation	
16:20-16:30	SO12 - PŘECH: Silica metal-oxide pillared zeolites – green selective oxidation catalysts	
16:30-16:50	O21 - VILLAMAINA: Cu-CHA catalysts for NH_3-SCR: the roles of SiO_2/Al_2O_3 and Cu loading in the Cu-speciation	
16:50-17:10	O22 - CAMPISI: Selective catalytic oxidation of ammonia (NH_3-SCO) on iron beta zeolite catalysts prepared by ion exchange and solvated metal atom dispersion	
17:10-19:00	Poster Session + Refreshments	
19:00-20:00	General Assembly AIZ	General Assembly GIC
20:30	Dinner	

THURSDAY, 13TH JUNE	
8:30-9:15	PL3 - Avelino Corma: Inspiration from research and technology by ENI and G. Bellussi (Chair: Maksym Opanasenko)
9:20-10:40	Session Th-1
9:20-9:40	O23 - VESELÝ: Zeolites in Pechmann condensation: Impact of framework topology and type of acid site
9:40-10:00	O24 - CASTOLDI: Metal-doped zeolites for low-T NOx adsorption: operando FT-IR spectroscopy and reactivity studies
10:00-10:10	SO13 - GÓMEZ-POZUELO: Catalytic biomass pyrolysis over KH-ZSM-5 zeolite with acid-base properties
10:10-10:20	SO14 - CHENET: Adsorption of p-hydroxybenzaldehyde onto zeolites for water remediation: evaluation of the competition between contaminant and natural organic substances
10:20-10:30	SO15 - PALOMINO-CABELLO: Sulfonamides photodegradation assisted by αFe_2O_3-TiO_2-P/ $K_2S_2O_8$ system
10:30-10:40	SO16 - CONFALONIERI: Dehydraton of an azeotrope solution at high pressure through a differential penetration of ethanol and water in Si-chabazite
10:40-11:00	Coffee Break
11:00-11:30	IL2 - Adriano Zecchina: Contribution of spectroscopies to zeolites and microporous materials science (Chair: Silvia Bordiga)
11:30-13:05	Microsymposium Carlo Lamberti (Chair: Gloria Berlier)
11:30-11:50	KN1 - BORFECCHIA: Understanding selective redox chemistry in Cu-zeolites: a synchrotron-enhanced multi-technique perspective
11:50-12:10	O25 - VAN BOKHOVEN: In situ characterization of zeolitic catalysts
12:10-12:30	O26 - BUSCA: Cobalt metal catalysts in the hydrogen chemistry: support and preparation effects in CO_2 methanation and ethanol steam reforming
12:30-12:40	SO17 - GIGLI: New insights on the crystal structure of ZSM-12 with azonia spiro salts
12:40-12:50	SO18 - CROCELLÀ: Advanced spectroscopic characterization of acidic sites in hierarchically structured zeolites as catalysts for hindered substrates
12:50-13:00	SO19 - BELTRAMI: Neutron and *in situ* synchrotron x-ray powder diffraction analysis to study the thermal activation of NH_4 omega zeolite
13:00-14:00	Lunch
14:00-15:30	Free Time
15:35-16:50	Session Th-2 (Chair: Francesco Di Renzo)
15:30-15:40	SO20 - POLISI: First hints on pressure-induced amino acids condensation in mordenite
15:40:15.50	SO21 - BRUNDU: Thermal transformation of (NH_4, Ba)-clinoptilolite to monocelsian, mullite, and cristobalite
15:50-16.00	SO22 - MANCINELLI: One-step deposition method for the synthesis of a nanocomposite membrane based on reduced graphene oxide/zeolite-A for adsorption of metal ions with enhanced antibacterial properties
16:00-16:20	O27 - GÓMEZ-HORTIGÜELA: Conformational sieving effect of ephedrine derivatives during the synthesis of zeolite materials
16:20-16:40	O28 - PIRONE: Nitrous oxide decomposition over copper-containing ZSM-5: unravelling the isothermal oscillatory behavior
16:40-16:50	SO23 - ATZORI: Mesoporous NiO-CeO_2 mixed oxides for CO and CO_2 co-methanation
16:50-20:00	Social Event
20:30	Dinner

FRYDAY, 14TH JUNE	
8:30-9:05	IL3 - Suheil Abdo: Key role of zeolitic technologies in meeting current and future societal needs (Chair: Petr Nachtigall)
09:10-10.50	Session Fr-1
9:10-9:20:	SO24 - VYSKOČILOVÁ: Solid acid catalysts for the direct hydration of dihydromyrcene
9:20:9:30	SO25 - ESPOSITO: Study of the effect of preparation procedure on the formation of active and stable ceria-zirconia supported molybdenum oxide catalysts for cyclooctene epoxidation
9:30:9:50	O29 - BELTRAMI: Mesoporous ZSM-5 loaded with amino acids: does secondary mesoporosity affect sorption capacity and thermal regeneration?
9:50:10:10	O30 - MAZUR: A kinetics study into the hydrolysis and intercalation processes within the ADOR mechanism
10:10-10:30	O31 - DIAZ: Ti-SBA-15 with tailor made pore size and particle morphology for epoxidation of vernonia oil
10:30-10:40	SO26 - CUMPLIDO: Synthesis of Al-rich ZSM-12 zeolite using a dabco derivative as a structure-directing agent
10:40-10:50	SO27 - PAPANIKOLAOU: Ni zeo-type catalysts for algal oil upgrading: role of acidity and active-site accessibility
10:50-11:20	Coffee Break
11:20-12:50	Session Fr-2 (Chair: Siglinda Peratoner)
11:20-11:40	O32 - GUTIÉRREZ-RUBIO: Guaiacol hydrodeoxygenation over Ni_2P supported on 2D-zeolites
11:40-11:50	SO28 - BOCCIA: Alkali metals promoted Ru/Al_2O_3 catalysts for CO_2 methanation
11:50-12:10	O33 - PIZZOLITTO: Effect of grafting solvent in the optimisation of SBA-15 acidity for levulinc acid production
12:10-12:30	O34 - LEO: Different activity and stability of Fe-containing MOF materials for fenton oxidation processes
12:30-12:40	SO29 - LÓPEZ-HERNÁNDEZ: CO catalytic oxidation reaction as a tool to evaluate the nature of Ag-catalysts
12:40-13:00	Final remarks

INDEX

ADSORPTION OF P-HYDROXYBENZALDEHYDE ONTO ZEOLITES FOR WATER REMEDIATION: EVALUATION OF THE COMPETITION BETWEEN CONTAMINANT AND NATURAL ORGANIC SUBSTANCES

Tatiana Chenet[1], Elena Sarti[1], Luisa Pasti[1], Elisa Rodeghero[2], Annalisa Martucci[2]

[1]Department of Chemistry and Pharmaceutical Sciences
University of Ferrara, Ferrara, Italy
[2]Department of Physics and Earth Sciences University of Ferrara, Ferrara, Italy
tatiana.chenet@unife.it

Water pollution is a phenomenon of increasing concern worldwide. Among the organic pollutants, hydrocarbons represent one of the most widespread classes of contaminants found in the environment. The main anthropogenic inputs of these pollutants in the water systems are caused by gasoline leakage from storage tanks, transportation, pipelines and petrochemical wastewaters.[1] Toluene is a hydrocarbon belonging to the BTEX class (Benzene, Toluene, Ethylbenzene, Xylene) which is frequently detected in all environmental compartments due to its wide use as solvent, antiknock agent in gasoline, and for the production of benzene. Toluene exposure can originate from different sources including drinking water, food, air and consumer products; prolonged exposure to this contaminant can lead to adverse effects on human health such as central nervous system, heart, liver, kidney and lung damage.[2]

High-silica zeolites have already been proven to be efficient eco-friendly adsorbents for the removal of several organic contaminants from aqueous solutions.[1] To evaluate the possible use of these materials in water remediation applications, the adsorption of toluene in water matrices containing naturally found organic molecules was explored.

Surface and ground waters contain natural organic matter (NOM) 40-80% of which is represented by humic substances, typically found in freshwater with a concentration range of 1-25 mg/L.[3] Belonging to this category, humic acids form a complex mixture of natural substances derived from the biodegradation of lignin; they are characterized by carboxyl and phenolic groups and they are resistant to further degradation.

p-Hydroxybenzaldehyde (p-HBA) is one of the monomers of humic acids that are more commonly found in natural waters. Moreover, p-HBA has molecular dimensions which are comparable with those of the contaminant selected, and smaller than the pore size of zeolites. In this work, 2 different zeolite topologies were chosen to investigate the adsorption of the selected organic compounds: zeolite ZSM-5 and Y, with MFI and FAU framework type topology and Si/Al ratio of 280 and 200, respectively. Bare and loaded samples were characterized by *in situ* X-ray synchrotron powders diffraction (ESRF-ID22 beamline, Grenoble) in the temperature range 25-600°C. Data were then elaborated by Rietveld method. Thermal analyses on exhausted samples were performed in air at up to 600°C using a STA 409 PC LUXX® - Netzch at 5°C/min heating rate.

Regarding the adsorption of the natural organic compounds, the system ZSM-5 – p-HBA was considered. Adsorption isotherms were determined at different pH values to establish the effect of this parameter onto the saturation capacity of the adsorbent

materials. The concentration of contaminants in the aqueous solution was determined by Headspace Gas Chromatography coupled to Mass Spectrometry (HS-GC-MS) and by HPLC-DAD. At a pH near the pKa of p-HBA (7.7) the adsorption decreases, especially at lower concentrations, whereas at lower pHs, where the undissociated form of p-HBA is predominant, the adsorption increases. Rietveld refinements indicated that in both zeolites, p-HBA molecules can be connected by means of hydrogen bonds through co-adsorbed water, to form organic–water complexes. The concentrations of HBA detected from the refined occupancies are in good agreement with those determined by both HS-GC-MS and thermogravimetric analyses.

Regarding the adsorption of the contaminant (TOL) from the aqueous matrix containing the natural humic acids monomer (p-HBA), it resulted that this latter does not show competitive behavior: the adsorption of TOL was slightly affected by the presence of p-HBA. The higher selectivity of both Y and ZSM-5 for TOL with respect to p-HBA was also confirmed from structural investigation of the selected zeolites loaded with single component solution of TOL and p-HBA and from a binary mixture containing both the chemicals (i.e. p-HBA and TOL). Strong similarities between the X-ray powder patterns after adsorption of the mixture and after only TOL adsorption, indicate that both zeolites adsorb preferentially and selectively toluene, also in the presence of p- HBA.
These findings confirm the high selectivity of zeolites for the removal of organic contaminants from waters in presence of natural components.

References:

[1]Sarti, E.; Chenet, T.; Pasti, L.; Cavazzini, A.; Rodeghero, E.; Martucci, A. Minerals **2017**, 7(2), 22.
[2]Yamaguchi, H.; Kidachi, Y.; Ryoyama, K. Arch. of Environ. Health, **2002**, 57(3), 232-238.
[3]Uyguner Demirel, C.; Bekbolet, M.; Swietlik, J. Control of Disinfection By-Products in Drinking Water Systems, January **2007**, 253-277.