Book of abstracts

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ISTITUTO PER LO STUDIO DI MATERIALI NANOSTRUTTURATI

Conference promoted by

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INTERNATIONAL UNION OF PURE AND APPLIED PHYSICS

AIMagn
Associazione Italiana di Magnetismo

Conference under the patronage of the University of Bologna

ALMA MATER STUDIORUM
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Conference partners

About the conference

ICM is back!

The 22nd International Conference on Magnetism (ICM2024) will be held in Bologna, Italy, June 30 – July 5, 2024. ICM is the largest conference of the magnetism community worldwide and is associated to IUPAP (International Union of Pure and Applied Physics) and its group C9-Magnetism. It covers the whole area of magnetism, from fundamental research to advanced applications.

ICM2024 continues a series of conferences held every three years, most recently in San Francisco (2018), Barcelona (2015) and Busan (2012). The cancellation of ICM2021 in Shanghai due to the worldwide pandemic was an extraordinarily unfortunate event, which we all hope will never repeat. This interruption makes ICM2024 all the more important – the organizers hope to relaunch the ICM-series and expect that more than 2,000 scientists from all over the world will travel to Bologna to attend the conference in person.

Bologna is a city of art and culture, with a historical heritage spanning three millennia. Its University, “Alma Mater Studiorum”, was established in 1088, and is considered to be the oldest university in the western world. Bologna is also an important site for architectural conservation, hosting numerous medieval towers and nearly 40 km of Porticoes. And Bologna is easy to travel to, with a major international airport just 7km away from the city center, flying to more than 100 destinations. The Central railway station means that in just one hour tourists can reach renowned art cities like Florence, Venice, Pisa, and Milan. Various beautiful beaches on all the four seas surrounding continental Italy are just a few hours away by car.

The ICM2024 sessions will take place in the newly renovated Bologna Congress Center, located inside the Bologna exhibition center 7 km from Bologna International Airport, and 3 km from Bologna Central Station, which are both served by multiple busses and taxis.

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THEMES AND TOPICS

The conference will be organized under the following themes:

Theme 1 Strongly Correlated Electrons Systems (SCES)

Chairs: Tatiana Guidi, Manuel Brando, Philipp Gegenwart

1.01 Unconventional superconductivity and magnetism in SCES
1.02 Topological states in SCES including Dirac and Weyl semimetals
1.03 Heavy fermion systems, Kondo physics and valence fluctuations including actinides
1.04 Frustration and quantum spin liquids
1.05 CEF effects and multipolar ordering in SCES
1.06 Quantum phase transitions and related phenomena including metal-insulator transitions
1.07 Non-equilibrium physics in SCES, including mesoscopic Kondo and non-equilibrium pump-probe states
1.08 Theoretical models and methods for strong correlations
1.09 Materials design and novel advanced materials
1.10 Fermi surfaces and electronic structure of correlated phase

Theme 2 Dimensionality in spin-related phenomena

Chairs: Silvia Picozzi, Aurelien Manchon, Roser Valenti

2.01 1D magnetism
2.02 Molecular magnetism
2.03 2D magnetic materials
2.04 Novel magnetic phenomena at surfaces and interfaces
2.05 Frustrated, disordered and quantum magnetic phases
2.06 Spin phenomena in topological materials
2.07 Advances in Theory and Simulations in low-dimensional magnetism
2.08 Chirality, Skyrmions and Exotic spin texture

Theme 3 Spintronics and Spin Dynamics

Chairs: Giovanni Carlotti, Luis E. Hueso, Yoshichika Otani

3.01 Spin transport, spin tunneling and spin torque phenomena
3.02 Spin caloritronics
3.03 Spin-orbit effects and spin-charge-orbit conversion phenomena
3.04 Electric field effects on magnetic systems and voltage controlled switching
3.05 Low-dimensional spintronics
3.06 Semiconductor & Molecular spintronics (including chirality-induced spintronics)
3.07 Antiferromagnetic spintronics
3.08 Vortex, skyrmion and domain wall dynamics
3.09 Magnonics
3.10 Ultrafast magnetization dynamics including terahertz spintronics
3.11 Spin-mediated coupling phenomena (including magnon-magnon, magnon-phonon and magnon-photon among others)

Quantum Magnetism and Thermal Expansion of dimorphic ?- and ?-Cu4O2(VO4)Cl

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frustration | Cu4 complexes | dimorphism | quantum magnets |

The field of mineralogy has proven to be a significant source of inspiration for all of the natural sciences, including solid-state physics where structural and chemical diversity of minerals plays a special role. Due to the spin-1/2 nature of the Cu2+ ion, copper oxysalts have gained significant interest, especially in the context of studying collective magnetic phenomena and discovering novel quantum magnets. A large number of Cu2+ oxysalt minerals are found in nature in volcanic fumaroles. Among the variety of exhalative copper minerals, a group of copper oxyvanadate-chloride minerals is distinguished. All these minerals are characterized by a high diversity of coordination environments of Cu2+ sites. Exploring the CuO-V2O5-CuCl2 system, we obtained two coparsite-based polymorphs, ?- (1) and ?-Cu4O2(VO4)Cl (2), carefully mapped out its stability range as a function of temperature by the single-crystal HT X-ray diffraction, and finally experimentally studied their magnetic properties and performed DFT calculations for both dimorphs.In the crystal structure of 1, four Cu sites form short and strong bonds to O1 site thus forming Cu4 tetrahedra, which share common edges thus forming [Cu4O2]4+ 4-periodic 1D-single rods. In the resulting structure, the {[O2Cu4]Cl}3+ complexes are interlinked into 3D framework via VO4 tetrahedra. 2 adopts a unique structure type, where Cu6O2 dimeric units form [Cu4O2]4+ layers parallel to the ac plane, where every third spin is replaced by a ferromagnetic spin dimer. This layered topology is known in Cu2O(SO4) [1]. The [Cu4O2]4+ layers and isolated vanadate groups form a framework with large voids occupied by chlorine atoms. 1 reveals an AFM phase transition TN = 24 K. Under a small magnetic field 0.1 T, the AFM peak is accompanied by a distinguishable splitting between the ZFC and FC data, suggesting a small ferrimagnetic component in addition to the AFM order. Such a behavior can result from a small deviation from the strictly antiparallel arrangement of spins in a canted AFM. Indeed, field-dependent magnetization measured at 2 K shows a narrow hysteresis with the remnant magnetization of 0.058 ?B/f.u. In this case, it may be associated with the deviation of the magnetic spins from parallel directions, thus, an uncompensated moment is created.

References

[1] Panther et al., Frustration relief and reorientation transition in the kagomelike dolerophanite Cu_2OSO_4. Phys. Rev. B, 108, (2023), 224410