

12th International Conference on Cryocrystals and Quantum Crystals (CC-2018)

Wrocław, Poland, August 26–31, 2018

Conference on Cryocrystals and Quantum Crystals (CC) has a long history that started in 1979 when the first seminar on cryocrystals and quantum crystals was organized in Viljandi, Estonia by V.G. Manzhelii (B. Verkin Institute for Low Temperature Physics and Engineering NASU, Kharkiv, Ukraine) and A.F. Prihot'ko (Institute of Physics NASU, Kyiv, Ukraine). The next seminars took place in Kharkiv (Ukraine), Donetsk (Ukraine), and Odessa (Ukraine). Since the meeting in Almaty (Kazakhstan) in 1995, the Conference obtained an international status. The great merit in achieving of this goal belongs to Prof. Vadim Manzhelii and Prof. Horst Meyer, the co-chairs of the first International CC-1995. The next two conferences took place in Poland, in September 1997 in Polanica Zdroj and in August 2000 in Szklarska Poreba. In 2002 the conference was held in Friesing (Germany) and in 2004 came back to Wrocław (Poland). The next editions were held in Kharkiv (Ukraine) in 2006, than again in Wrocław (Poland) in 2008, Chernogolovka (Russia) in 2010, Odessa (Ukraine) in 2012, Almaty (Kazakhstan) in 2014. The last meeting was held in 2016 in Turku (Finland).

The 12th International Conference on Cryocrystals and Quantum Crystals (CC-2018) was held in Wrocław, Poland, August 26–31, 2018. It was co-organized by W. Trzebiatowski Institute of Low Temperature and Structural Research PAS, Wrocław Branch of the Polish Academy of Sciences, and Wrocław University of Science and Technology. The actual venue of CC-2018 was the Wojanów Palace near Jelenia Góra, which is located 110 km from Wrocław, a historical romantic manorial residency surrounded by the beautiful landscape of the Karkonosze National Park.

Conference on Cryocrystals and Quantum Crystals (CC) has been an important international forum for presenting new results on physics and chemistry of atomic and molecular solids such as rare gas solids, hydrogens, nitro-

gen, oxygen, methanes, helium isotopes, water ice, etc. The scope of CC is wide, including, but not limited to, films, nanoscale systems, thermodynamic and mechanical properties of cryocrystals and quantum crystals, impurity-helium condensates, charged species in cryocrystals, spectroscopy of cryocrystals, ultra-low temperature and high-pressure studies, matrix isolation in cryocrystals, ultrafast dynamics in crystals, order-disorder phenomena, technological applications and instrumentation.

In the CC-2018 participated 80 scientists from 16 countries (Canada, China, Finland, France, Germany, Italy, Slovakia, Japan, Korea, Kazakhstan, Poland, Ukraine, Russia, Spain, UK, and USA). The CC-2018 conference program included 23 invited lectures and 18 contributed oral talks; at the poster sessions 37 poster presentations were discussed.

One of the most hot topics of the conference was metallization of hydrogen at ultrahigh pressures: I. Silvera (Cambridge, US) "Metallic hydrogen and deuterium. The Wigner–Huntington and the liquid–liquid transitions", A. Goncharov (Washington, US) "Metallization of hydrogen and superhydrides at high pressures".

Properties of dense quantum hydrogenous materials, methanes and ice structures were the subject of the invited talks by S. Mao (Carnegie Institution of Washington, US) "Electronic dynamics of hydrogen at megabar pressure", W. Nellis (Cambridge, US) "Dense quantum hydrogenous materials", B. Monserrat (Cambridge, UK) "New structures of high-pressure hydrogen", Ch.-Sh. Yoo (Pullman, US) "Noble chemistry in dense quantum solid", L. Yakub (Odessa, UA) "Thermodynamic properties of CH₄, CCl₄, and CF₄ on the melting line. Theory and computer simulation", J. Tse (Saskatchewan, CA) "*In situ* low-temperature and high-pressure studies on the ice structure", T. Nomura (Dresden, DE; JP) "Solid oxygen in ultrahigh magnetic fields" and F. Soubiran (Lyon, FR) "*Ab initio* study of iron-nickel alloys at high pressures".

The most recent investigations of phenomena in condensed helium were the subject of the invited talks by R. Nomura (Tokyo, JP) “Crystallization dynamics of ^4He in aerogels”, J. Sauls (Evanston, US) “Is superfluid ^3He the precursor to magnetically ordered solid ^3He ?”, J. Saunders (London, UK) “Evidence for a helium supersolid in two dimensions”, H. Fukuyama (Tokyo, JP) “Novel quantum phases of helium confined in two dimensions from quantum liquid crystals to spin liquid”, J. Boronat (Barcelona, ES) “Quantum behavior of defects in solid ^4He ”, E. Kim (KAIST, Korea) “Reinvestigation of the rotation effect in solid ^4He with a rigid torsional oscillator” and J. Amrit (Paris, FR) “Thermal interface resistance of classical solids with quantum fluids and crystals”.

Astrophysical aspects of Physics of Cryocrystals was the subject of two invited talks by E. Gordon (Chernogolovka, RU) “Cryocrystals in the space: low-temperature evolution of interstellar dust” and H. Rothard (Caen, FR) “Heavy ion irradiation of crystalline, and amorphous astrophysical ices and biomolecules”.

Glasses and amorphous solids, quantum diffusion, spectroscopy and dynamics of molecules in cryogenic matrices were the topics of one more group of invited talks: G. Jug (Como & Pavia, IT) “The structure of amorphous solids as revealed by low-temperature physics; bulk glasses and thin amorphous films”, M. Ramos (Madrid, ES) “Low-temperature specific heat of low-molecular-weight glasses and glassy crystals”, M.A. Strzhemechny (Kharkiv, UA) “Heat capacity of molecular solids. Special case of cryocrystals”, D. Anderson (Laramie, US) “Quantum diffusion of hydrogen atom defects in solid parahydrogen”, C. Crepin-Gilbert (Saclay (Paris), FR) “Molecules with intramolecular hydrogen bonds trapped in “classical” and “quantum” cryogenic matrices: spectroscopy and dynamics”.

The material of these CC-2018 Proceedings include only a selection of the reports (about 1/4 of the total number of presentations) submitted by their authors to the Program Committee for publications in this issue of magazine. These papers have been refereed and, if necessary, revised before being accepted for inclusion in the Proceedings. We are very grateful to the referees for their quick and very thoughtful responses. We would like to thank all the members of the Program and Advisory Committees for their

efforts in the preparation and administration of the Conference; with special thanks to the members of the Local Organizing Committee who did their best to make a success of CC-2018. Our grateful acknowledgments are also due to the sponsors of the Conference: Institute of Low Temperature and Structure Research PAS, Wrocław Branch of the Polish Academy of Sciences, Wrocław University of Science and Technology, Wrocławskie Centrum Akademickie (WCA), Crystals (an Open Access Journal by MDPI), and TESPOL engineering.

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We honor the memory of our recently deceased distinguished colleagues, organizers, and active participants of International Conferences on the Physics of Cryocrystals and Quantum Crystals Andrei Drobyshev (September 11, 1950–December 20, 2018) and Yevgeny Gordon (September 8, 1940–January 15, 2019).

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