

CONTENTS

Preface	v
Introduction	vii
Part I. Basic Dusty Plasmas	
Perspectives of collective processes in dusty plasmas: a keynote address P.K. Shukla	3
Non-ideal effects in dusty plasmas N.N. Rao	13
The kinetic approach to dusty plasmas V.N. Tsytovich and U. de Angelis	21
Dynamical and structural properties of strongly coupled dusty plasmas M.S. Murillo	29
Directional ordering and dynamics in dusty plasmas J.E. Hammerberg, B.L. Holian, M.S. Murillo and D. Winske	37
Multiple-sheath and the time-dependent grain charge in a plasma with trapped ions Y.-N. Nejoh	43
Surface charge on a spherical dust H. Amemiya	49
Numerical simulation model for dust expansion into a plasma G.S. Chae, W.A. Scales, G. Ganguli, P.A. Bernhardt and M. Lampe	55
Interaction potential between two Debye spheres J.X. Ma and F. Pan	61
Coupling of waves and energy conversion in a slowly varying nonuniform dusty plasma M. Khan, S. Sarkar, T.K. Chaudhuri, A.M. Basu and S. Ghosh	67

Part II. Plasma Crystals – New Material

Classical atom-like dust Coulomb clusters in plasma traps Lin I, Y.-J. Lai, W.-T. Juan and M.-H. Chen	75
Crystallography and statics of Coulomb crystals Y. Hayashi and A. Sawai	83
Monolayer plasma crystals: experiments and simulations J. Goree, D. Samsonov, Z.W. Ma, A. Bhattacharjee, H.M. Thomas, U. Konopka and G.E. Morfill	91
Nonlinear dust equilibria in space and laboratory plasmas V.N. Tsytovich	99
Dust particle structures in low-temperature plasmas A.P. Nefedov	107
Experimental evidence for attractive and repulsive forces in dust molecules A. Melzer, V.A. Schweigert and A. Piel	115
Self-organization in dusty plasmas S. Benkadda, V.N. Tsytovich, S.I. Popel and S.V. Vladimirov	123
Dynamical properties of strongly coupled dusty plasmas S. Hamaguchi and H. Ohta	135
Structures and structural transitions in strongly-coupled Yukawa dusty plasmas and mixtures H. Totsuji, C. Totsuji, K. Tsuruta, K. Kamon, T. Kishimoto and T. Sasabe	141
Vortex chains and tripolar vortices in dusty plasma flow J. Vranješ, G. Marić and P.K. Shukla	147
Dynamical structure factor of dusty plasmas including collisions A. Wierling, V.J. Bednarek and G. Röpke	153
Melting of the defect dust crystal in a rf discharge I.V. Schweigert, V.A. Schweigert, A. Melzer and A. Piel	159

Part III. Industrial Applications

On the powder formation in industrial reactive rf plasmas Ch. Hollenstein, Ch. Deschenaux, D. Magni, F. Grangeon, A. Affolter, A. A. Howling and P. Fayet	169
--	-----

Trapping and processing of dust particles in a low-pressure discharge E. Stoffels, W.W. Stoffels, G.H.P.M. Swinkels and G.M.W. Kroesen	177
Effects of gravity, gas and plasma on arc-production of fullerenes T. Mieno	185
Formation of dust and its role in fusion devices J. Winter	193
The formation and behavior of particles in silane discharges A. Gallagher	199
Dust particles influence on a sheath in a thermoionic discharge M. Mikikian, C. Arnas, K. Quoth and F. Doveil	207
Plasma deposition of silicon clusters: a way to produce silicon thin films with medium-range order? P. Roca i Cabarrocas	213

Part IV. Atmospheric and Astrophysics

Formation of a dust-plasma cloud A.M. Ignatov	229
Effects of dust on Alfvén waves in space and astrophysical plasmas N.F. Cramer and S.V. Vladimirov	237
Investigation of plasma irregularity generation in expanding ionospheric dust clouds W.A. Scales, G.S. Chae, G. Ganguli, P.A. Bernhardt and M. Lampe	245
Mass distributions and self-gravitation in dusty plasmas F. Verheest	253
Statistical description and 3D computer modeling of relaxing dusty plasmas Y.I. Chutov, O.Yu. Kravchenko, P.P.J.M. Schram and R.D. Smirnov	261
Regular structures in dusty plasmas due to gravitational fields N.L. Tsintsadze, J.T. Mendonca, P.K. Shukla, L. Stenflo and J. Mahmoodi	269
A rocket-borne detector for charged atmospheric aerosols S. Robertson, M. Horányi, B. Smiley and B. Walch	275
Paleo-heliosphere: effects of the interstellar dusty wind based on a laboratory simulation S. Minami and S. Miono	281

Current loop coalescence in dusty plasmas J.I. Sakai and N.F. Cramer	289
Jeans–Buneman instability in non-ideal dusty plasmas S.R. Pillay, R. Bharuthram, F. Verheest, N.N. Rao and M.A. Hellberg	295

Part V. Basic Experiments

Waves and instabilities in dusty plasmas N. D'Angelo	303
Dust charging in the laboratory and in space M. Horányi and S. Robertson	313
Charging measurements and planetary ring simulation by fine particle plasmas T. Yokota	321
Structure controls of fine-particle clouds in dc discharge plasmas N. Sato, G. Uchida, R. Ozaki, S. Iizuka and T. Kamimura	329
Structural formation and stability of Coulomb clouds in medium through low gas pressure range S. Takamura, N. Ohno, S. Nunomura, T. Misawa and K. Asano	337

Poster Session

Poster Session A: Basic Physics of Dusty Plasmas

Kelvin–Helmholtz instability in weakly non-ideal magnetized dusty plasmas with grain charge fluctuations N.N. Rao	347
Self-similar expansion of a non-ideal unmagnetized dusty plasma R. Bharuthram and N.N. Rao	351
Computer modeling of non-linear sheaths with dust particles Y.I. Chutov, O.Yu. Kravchenko, P.P.J.M. Schram and V.S. Yakovetsky	355
The gravitational effect on negatively-charged dust-grains in a plasma H. Yamaguchi, Y.N. Nejoh and N. Mizuno	359
Stationary equilibria of dusty plasmas R.T. Faria Jr., P.H. Sakanaka, T. Farid and P.K. Shukla	363

Contents

xiii

Photoelectric charging of dust particles A. Sickafoose, J. Colwell, M. Horányi, S. Robertson and B. Walch	367
Influence of dust grains rotation on waves dispersion in plasmas J. Mahmoodi, N.L. Tsintsadze and D.D. Tskhakaya	373
Plasma-maser instability in magnetized dusty plasma B.J. Saikia and M. Nambu	377
Ion bursts in a negative ion plasma S. Yoshimura, M. Yohen and Y. Kawai	381
Nonlocal effects in an ion beam driven ion acoustic waves in a magnetized dusty plasma S.C. Sharma and M. Sugawa	385
Experimental observation of attraction of massive bodies in a plasma A.E. Dubinov, V.S. Zhdanov, A.M. Ignatov, S.Yu. Kornilov, S.A. Sadovoi and V.D. Selemir	389
The role of random grain-charge fluctuations in dusty plasmas S.A. Khrapak, O.F. Petrov and O.S. Vaulina	393
Shock waves in plasmas containing dust particles S.I. Popel and V.N. Tsytovich	397
Investigation of the ordered structure formation in a thermal dusty plasma Y.K. Khodataev, S.A. Khrapak and O.F. Petrov	401
Separation of diamagnetic fine particles in a non-uniform magnetic field I. Tsukabayashi, S. Sato and Y. Nakamura	405
Minimal charge asymmetry for Coulomb lattices in colloidal plasmas: effects of nonlinear screening O. Bystrenko and A. Zagorodny	409
Characteristics of asymmetric ion sheath in a negative ion plasma K. Koga, H. Naitou and Y. Kawai	413
Coherent interaction model of attractive forces in the plasma crystals I. Mori, T. Morimoto and K. Tominaga	417
Charge distribution function of negatively and positively charged plasma dust particles B.F. Gordiets and C.M. Ferreira	423
Control of ultra-fine particles in plasma by an electromagnetic field K. Takeda, N. Kawashima, T. Etoh, Y. Takehara, H. Kubo and S. Bessho	427

Poster Session B: Strongly Coupled Dusty Plasmas

Damping of collective excitations in Coulomb crystals V.J. Bednarek, A. Wierling and G. Röpke	433
Behaviour of particles released from inner walls in an ECR plasma etch tool T. Kamata, K. Miwa and H. Arimoto	437
Anomalous diffusion and finite size effect in strongly coupled 2-D dust Coulomb clusters W.-T. Juan, Y.-J. Lai and Lin I	441
Plasma crystals and liquids in DC glow discharge V.E. Fortov, V.I. Molotkov and V.M. Torchinsky	445
Formation of ring-shaped fine-particle clouds in a DC plasma G. Uchida, R. Ozaki, S. Iizuka and N. Sato.....	449
Vertical spread of fine-particle clouds in a magnetized DC plasma S. Iizuka, R. Ozaki, G. Uchida and N. Sato.....	453
Vertical string structure of fine particles in a magnetized DC plasma R. Ozaki, G. Uchida, S. Iizuka and N. Sato.....	457
Determination factor of Coulomb crystal structure in dusty plasmas K. Takahashi and K. Tachibana	461
Instabilities of dust particles levitated in an ion sheath with low gas pressure T. Misawa, S. Nunomura, K. Asano, N. Ohno and S. Takamura	465
Instabilities of the dust-plasma crystal N.F. Cramer and S.V. Vladimirov	469
Some remarks on dust lattice waves in plasma B. Farokhi, N.L. Tsintsadze and D.D. Tskhakaya	473
Artificial fireball as dust-plasma cloud A.M. Ignatov, L.V. Furov, V.N. Kunin, V.S. Pleshivtsev and A.A. Rukhadze	477
Quenching of a high-temperature phase of Fe nanoparticles by a microwave plasma processing K. Tanaka, T. Fukaya, K. Kawase, J. Fujita and S. Iwama	481
Observation of dust particles trapped in a diffused plasma produced by low pressure RF discharge N. Hayashi, T. Kimura and H. Fujita	485
RF potential formation in a magnetised plasma containing negatively charged particles P. Cicman, A. Kaneda, N. Hayashi and H. Fujita	489

Contents

xv

Formation of particle conglomerates in a methane discharge W.W. Stoffels, E. Stoffels, G. Ceccone and F. Rossi	493
Change of the potential relaxation instability in a plasma containing heavy C ₆₀ ⁻ ions D. Strele, C. Winkler and R. Schrittwieser	497
Experimental verification of dust particle's transport by ambipolar $E \times B$ drift Y. Maemura, M. Ohtsu, T. Yamaguchi and H. Fujiyama	501
Nuclear induced dusty plasma structures L.V. Deputatova, V.E. Fortov, A.V. Khudyakov, V.I. Molotkov, A.P. Nefedov, V.A. Rykov and V.I. Vladimirov	505
Experimental investigation and numerical simulation of inductively coupled dusty plasma V.S. Filinov, A.P. Nefedov, V.A. Sinel'shchikov, O.A. Sinkevich, A.D. Usachev and A.V. Zobnin	509
Dust wake in a collisional plasma D. Winske, W.S. Daughton, D.S. Lemons, M.S. Murillo and W.R. Shanahan	513
Measurement of electric charge of dust particles in a plasma M. Itoh, T. Fujimori, Y. Komatsu and Y. Nakamura	517
Transport of a polydisperse ensemble of dust particles in plasma I.V. Schweigert and V.A. Schweigert	521
Influence of the lattice symmetry on melting of the bilayer Wigner crystal I.V. Schweigert, V.A. Schweigert and F.M. Peeters	525
Poster Session C: Collective Effects and Astrophysics	
Effects of dust grains on planar RF discharges S. Nonaka, K. Katoh, Y. Nakamura, S. Ikezawa and S. Takamura	531
Experimental studies of UV-induced dusty plasmas under microgravity V.E. Fortov, A.P. Nefedov, V.P. Nikitsky, A.I. Ivanov and A.M. Lipaev	535
Parameters of dusty particles in plasma flows A.A. Samarian, O.S. Vaulina, A.V. Chernyshev, A.P. Nefedov and O.F. Petrov	539
Hard X-rays from high power density plasma "dust" Yu.K. Kurilenkov, M. Skowronek, G. Maynard and J. Dufty	543
From dusty plasma target to hard X-ray lasant media M. Skowronek, Yu.K. Kurilenkov and G. Louvet	547

Coupling between Jeans and X-modes in self-gravitating magnetized dusty plasmas M.A. Hellberg, R. Bharuthram, R.L. Mace, P. Singh and F. Verheest	551
Fluctuation electrodynamics of dusty plasmas V.P. Kubaichuk and A.G. Zagorodny	555
Measurement and modeling of particle spacing in strongly coupled dusty plasmas M.S. Murillo and H.R. Snyder	559