

Table of Contents

Preface	iii
Contents	v
Overview and Facts about the Electrochemical Society	viii

Exfoliation and Layer Transfer Technologies

Overview on Some Recent Advances in Wafer Bonding Technologies H. Moriceau , F. Fournel , O. Rayssac , A.M. Cartier, C. Morales, S. Pocas, M. Zussy, E. Jalaguier, B. Biasse, B. Bataillou, A.M. Papon, C. Lagahe, B. Aspar, C. Maleville, F. Leterte, B. Ghyselen and T. Barge (invited)	1
Layer Transfer using Implant and Exfoliation Techniques K.D. Hobart and F.J. Kub (invited)	17
Silicon Wafer Direct Bonding for Smart-Cut SOI with Buried Tungsten Silicide Layer S.L. Suder, R. Hurley, F.X. Li, M. Bain, P. Baine, D. W. McNeill, B.M. Armstrong and H.S. Gamble (invited)	19

Fundamental Wafer Bonding Mechanisms

Low Temperature Plasma Assisted InP-To-Silicon Wafer Bonding: An Alternative to Heteroepitaxial Growth D. Pasquariello and K. Hjort (invited)	20
Effects of Plasma Activation on Hydrophilic Bonding of Si and SiO ₂ T. Suni, K. Henttinen, I. Suni, and J. Maekinen	22
Wafer Bonding using Oxygen Plasma Treatment in RIE and ICP RIE A. Sanz-Velasco, P. Amirfeiz, S. Bengtsson and C. Colinge	31
Bonding Strength and Electrical Characteristics of Si/Si, Si/InP and Si/GaAs Interfaces Bonded by Surface Activated Bonding at Room Temperature: Influences of Sputtering Time and Energy M. Howlader, T. Watanabe, and T. Suga	41

Low Temperature UVH Bonding

UHV-Bonding: Electrical Characterization of Interfaces and Application to Magnetoelectronics S. Senz, A. Reznicek, A. Kumar, R. Scholz, and U. Goesele (invited)	48
Why Does a Plasma Treatment Prior to the Wafer Direct Bonding Increase the Bonding Energy of Silicon Wafer Pairs in the Low-Temperature Range ? M. Wiegand, M. Reiche and G. Kraeuter	62

Fast Silicon to Silicon Wafer Bonding with an Intermediate Glass Film 74
M.M. Visser, D.T. Wang and A.B. Hanneborg

A Comparison of Interfacial Fracture Energy of Bonded Wafers Using a Micro- 84
Indentation and Crack Propagation Techniques
C.A. Colinge, M.C. Shaw, R.H. Esser and K.D. Hobart

Bonded Heterostructures

Bonded Polycrystalline SiC Substrates for the Growth and Fabrication of GaN FETs 92
K.D. Hobart, F.J. Kub, R. Esser, G.G. Jernigan, M. Fatemi, S.C. Binari, D.S. Katzer, H.
B. Dietrich, G. Kipshidze, S. Nikishin, and H. Temkin

Micro-Reflector Light Emitting Diodes with Buried Mirror 100
S. Illek, U. Jacob, A. Ploessl, P. Strauss, K. Streubel, W. Wegleiter und R. Wirth

Characterization & Devices

An Investigation into Interfacial Oxide in Direct Silicon Bonding 106
P. McCann, S. Byrne, and A. Nevin

Electrical and Structural Investigation of Bonded Silicon Interfaces 114
A. Reznicek, S. Senz, O. Breitenstein, R. Scholz, and U. Goesele

Improved Low Temperature Hydrophobic Si-Si Bonding Techniques 126
R. Esser, K. D.Hobart, and F.J. Kub

Silicon-Direct Wafer Bonding for Fabrication of RF Microwave Devices 136
I.K. Bansal

Novel Bonding Applications

Wafer Bonding Using Low-k Dielectrics as Bonding Glue in Three-Dimensional 145
Integration
Y. Kwon, J.-Q. Lu, R.J. Gutmann, R. P. Kraft, J. McDonald, and T.S. Cale

One Micron Wafer to Wafer Alignment for 3D Interconnecting Device Integration 155
C. Brubaker, T. Glinsner, P. Lindner, C. Schaefer and M. Tischler

Fabrication Process and Plasticity of Gold-Gold Thermocompression Bonds 163
C.H. Tsau, M.A. Schmidt, and S.M. Spearing

SOI Applications

Current Status and Future Direction of SOI Technology M. Yoshimi (invited)	171
High Performance CMOS on SOI I. Y. Yang, S. Fung, J. Sleight, S. Narasimha, N. Zamdmer, P. Smeys, J. Welser, P. Agnello, E. Leobandung and G. Shahidi (invited)	177
Scalable Potential and Volume Production in ELTRAN (R); SOI-Epi Wafers TM K. Sakaguchi and T. Yonehara (invited)	197
A Si/SiO ₂ /Si Heterostructure Barrier Varactor Diode Made by Wafer Bonding S. Bengtsson	205

High Voltage and High Power Applications

Device Applications Using Bonded Thick SOI Wafers S. Fujino, S. Takahashi, T. Fukada, H. Himi, and K. Kawamoto (invited)	214
Factors Affecting Stress-Induced Defect Generation in Trenched SOI for High-Voltage Applications W. A. Nevin, K. Somasundram, P. McCann, X. Cao, and S. Byrne	232
Bi-Directional Double-Side Double-Gate IGBT Fabricated by Wafer Bonding F.J. Kub, K.D. Hobart, M. Ancona, J.M. Neilson, K. Brandmier and P.R. Waingand	242

Applications to MEMS

Anodic Bonding for MEMS H. Jakobsen, A. Lapadatu and G. Kittilsland (invited)	243
Wafer Bonding for Optical Microsystems - E. Hiller, D. Stolze, M. Wiegand, V. Dragoi, and M. Reiche	254
Effect of Anodic Bonding on Reliability of Sensors and MOS Circuitry K. Schjolberg-Henriksen , A.B. Hanneborg, G.U. Jensen, A.C. Lapadatu, H. Jakobsen	265
High Pressure Sensor Based on Fusion Bonding K. Birkelund, M. Soerensen, S. Chiriaev, P. Gravesen, and P. B. Rasmussen	275
Surface Treatment Optimisation for Quartz Direct Bonding O. Vallin, B. Einefors, and C. Hedlund	287
Author Index	290
Subject Index	292