



# **MARKSCHEME**

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**CHEMISTRY**

**Standard Level**

**Paper 1**

# N13 4 Chemistry Spm Tzxx

**Yannick Le Tiec**



## **N13 4 Chemistry Spm Tzxx:**

Chemistry in Microelectronics Yannick Le Tiec, 2013-02-28 Microelectronics is a complex world where many sciences need to collaborate to create nano objects we need expertise in electronics microelectronics physics optics and mechanics also crossing into chemistry electrochemistry as well as biology biochemistry and medicine Chemistry is involved in many fields from materials chemicals gases liquids or salts the basics of reactions and equilibrium to the optimized cleaning of surfaces and selective etching of specific layers In addition over recent decades the size of the transistors has been drastically reduced while the functionality of circuits has increased This book consists of five chapters covering the chemicals and sequences used in processing from cleaning to etching the role and impact of their purity along with the materials used in Front End Of the Line which corresponds to the heart and performance of individual transistors then moving on to the Back End Of the Line which is related to the interconnection of all the transistors Finally the need for specific functionalization also requires key knowledge on surface treatments and chemical management to allow new applications

Contents 1 Chemistry in the Front End of the Line FEOL Deposits Gate Stacks Epitaxy and Contacts Fran ois Martin Jean Michel Hartmann V ronique Carron and Yannick Le Tiec 2 Chemistry in Interconnects Vincent Jousseau Paul Henri Haumesser Carole Pernel Jeffery Butterbaugh Sylvain Ma trejean and Didier Louis 3 The Chemistry of Wet Surface Preparation Cleaning Etching and Drying Yannick Le Tiec and Martin Knotter 4 The Use and Management of Chemical Fluids in Microelectronics Christiane Gottschalk Kevin Mclaughlin Julie Cren Catherine Payne and Patrick Valenti 5 Surface Functionalization for Micro and Nanosystems Application to Biosensors Antoine Hoang Gilles Marchand Guillaume Nonglaton Isabelle Texier Nogues and Francoise Vinet

About the Authors Yannick Le Tiec is a technical expert at CEA Leti Minatec since 2002 He is a CEA Leti assignee at IBM Albany NY to develop the advanced 14 nm CMOS node and the FDSOI technology He held different technical positions from the advanced 300 mm SOI CMOS pilot line to different assignments within SOITEC for advanced wafer development and later within INES to optimize solar cell ramp up and yield He has been part of the ITRS Front End technical working group at ITRS since 2008

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