Editorial

Around Field Ion Microscopy and Atom Probe techniques
some news from a lively community in Europe and other countries

From its invention by E.W. Müller, the field ion microscope (FIM) has demonstrated its very high spatial resolution with the recording of atomic resolution images. It became a very useful tool for material science studies and various problems, such as the early stages of phase transformation in metallic alloys, could be investigated on a subnanometric scale. The atom-probe technique also due to E.W. Müller about twenty five years ago, has added a powerful analytical dimension to the instrument, giving access to quantitative concentration profiles with an ultimate resolution of a single layer in depth. A new insight into precipitation processes, surface phenomena or ordering transitions was thus available.

In the early seventies, ten or a dozen laboratories around the world undertook the construction of Field Ion Microscopes combined with atom-probes and a high performance machine (VSW Technology) has been commercially produced for a few years. Over thirty research groups are now involved in material science or surface physics studies, using FIM techniques. They are mostly located in Europe (for instance, four german laboratories in Göttingen, Berlin... have specific activities in physical metallurgy), in USA and in Japan. A few FIM teams are known to exist in eastern Europe and these techniques have also been recently introduced in China.

The atom-probe community joins every year at the International Field Emission Symposium (IFES). The last one held in august 1991 in Vienna, Autria, was attended by more than one hundred scientists. All topics related to field effects and applications are covered in these symposia, with an emphasis on field electron microscopy, field ion microscopy, scanning tunnelling microscopy, field ionization mass spectrometry, atom-probe analysis, field sources of charged particles, such as liquid metal ion sources... Applications in physics, metallurgy, chemistry include radiation effects, oxidation processes, surface segregation, catalysis, phase transformations. The next symposium is to take place, this coming summer, in Halifax, Canada. Furthermore German-French Field Emission symposia are organized every two or three years, alternatively in Germany and in France. The original idea for this smaller size meeting is to offer an alternative informal support for discussions and exchanges when the IFES symposium is not held in Europe. The last two of these meetings were in Rouen (1987) and in Bonn (1990) : Dr. G.D.W. Smith from Oxford was the special guest at Rouen.

The existence of these symposia is of utmost importance not only for the interests of the Field Emission Society members, but also for the future of Field Ion Microscopy in Europe. In France, as well as in other European countries (UK, Sweden...), only one laboratory is involved in FIM studies. Meetings are thus quite vital for the emulation of researches, the evolution of concepts and the exchange of ideas. Impressive progress in instrumentation has also been observed during the last decade. For instance, the idea of a new generation of three dimensional atom-probe has become a reality. The construction of a position sensitive atom-probe by the Oxford group has stimulated several teams to develop their own tomographic atom-probe, one of them in Rouen and other active projects have been identified in USA. With the emergence of this new class of

instrument, original information on a quasi-atomic scale becomes available concerning the topology, the microstructure and the chemical heterogeneities of material science specimens.

However it is also clear that the involved community must not remain focused on its own techniques but has much to teach and to learn from the confrontation and comparison with other nanoanalytical tools. With this idea in mind, we have introduced in the program of the next French Electron Microscopy Society meeting in Rouen (1-3 July 1992), a special symposium "Nanoanalysis : recent developments and present limits", where FIM people will have the opportunity to compare their data with those obtained by electron microscopists. It is expected that the mutual interaction of the two groups will be very fruitful for an improved knowledge of microstructures at an atomic scale.

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