

## PREFACE

Until 1974, only a few halide glass forming systems – primarily  $\text{ZnCl}_2$  and those based on  $\text{BeF}_2$  – were known. These were mainly of academic interest. In March, 1974 Michel Poulain, then a research technician at the Université de Rennes, produced quite by accident the first known heavy metal fluoride glass while attempting to synthesize a fluorozirconate single crystal. An extensive research effort in these materials was started at the Université de Rennes, partly because of the practical implications of their broad range of I.R. transparency and partly because of their novelty. A large number of published papers on heavy metal fluoride glasses, starting in 1975, resulted from this work. However, it was not until about 1978 that the French work began to be noticed and similar research efforts were commenced in laboratories in England, the United States and Japan. In 1979, it was realized that heavy metal fluoride glasses had real potential as materials for fiber optic waveguides which might exhibit losses 100 times less than those of silica based fibers.

In 1980, two of the editors of these volumes (MGD and CTM) met with Jacques Lucas in the Boston area to discuss mutual research interests. During this meeting, the opinion was jointly ventured that there was now sufficient activity in halide glasses to warrant a small informal conference. At that time, we thought such a meeting might attract perhaps twenty-five participants. It was nearly two years later, in March 1982, that this meeting actually occurred, ably implemented in a more formal fashion by John Gannon, held at Cambridge University in the U.K., and entitled the "First International Symposium on Halide and Other Non-Oxide Glasses." The major portion of this conference was devoted to halide glasses, and by that time interest in the field had picked up to the point that 39 papers were presented on halide glasses and 96 conferees took part in the meeting.

This first Symposium was so successful that it was immediately decided to hold a second meeting, restricted now to halide glasses only. The "Second International Symposium on Halide Glasses," organized by one of us (CTM) took place in August, 1983 at Rensselaer Polytechnic Institute in the U.S.A. This time, 60 papers were presented and 135 persons participated.

The "Third International Symposium on Halide Glasses," organized by Jacques Lucas, was held at the Université de Rennes in France in June, 1985. The accelerating research activity in this area was evidenced by the fact that 109 papers were presented and some 220 scientists and engineers were in attendance. At this point it was decided that interest in halide glasses was sufficiently widespread that formal publication of the Symposium papers was warranted. These appeared as Volumes 5 and 6 of Materials Science Forum.

In the present two volumes are collected the papers given at the "Fourth International Symposium on Halide Glasses," organized by one of the editors (MR) and held in Monterey, California in the USA in January, 1987. During this four day meeting, 88 papers were presented and 162 conferees were in attendance.

As will be evident to the reader, the field of halide glasses is still maturing, and some fundamental questions with regard to the structure, properties and behavior of halide glasses, especially the fluorozirconates, are being answered. For example, it now seems to be well established that the minimum intrinsic optical loss in fluorozirconates is about 0.02 dB/km at 2.5  $\mu\text{m}$ , roughly an order of magnitude lower than that in high silica glasses. Likewise, marked advances have been made since the Third Symposium in understanding the crystallization and nucleation process and

the sources of extrinsic scattering in fluorozirconate glasses. New discoveries and developments continue to be made, e.g., the demonstration of IR-to-visible frequency upconversion in a rare earth doped heavy metal fluoride glass and preparation of  $\text{BeF}_2\text{-AlF}_3$  glasses by chemical vapor deposition. There has been steady progress in the ambitious effort to produce fluorozirconate glass fibers of reasonable strength with losses lower than those of the best silica fibers. The current record is 0.7 dB/km on a fiber thirty meters long.

The "Fifth International Symposium on Halide Glasses" has been scheduled for May 29-June 1, 1988 in Japan and will be organized by Masayuki Yamane. In the meantime, we hope that these two volumes will give the reader a state-of-the-art picture of halide glass science and engineering.

Organization of this Symposium would not have been possible without the help of many, many of our colleagues and coworkers. To them, we extend our heartfelt thanks. Likewise, with regard to the always important financial side, implementation of the Symposium could not have been accomplished without support from government agencies in the United States and private companies in both the United States and Japan. Our sincerest thanks to them also.

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