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Preface

Rare-earth (RE) ions play an important role in much of modern optical technology as active constituents of several different materials. The first use of rare earths in ceramic materials was likely suggested by P. Drosbach in a German Patent issued in 1896, where he considered the coloring effects of rare earths on glasses. The history of effective use of RE's in industry may be dated to the 1950s with the employment of europium as the phosphor in the television cathode ray tubes (CRTs).

Nowadays, there are an amazing number of applications for the RE-activated materials, and much of today's cutting-edge optical technology and future innovations rely on their unique properties. Luminescence is among the most important characteristics of rare earths, and it provides the basis for some of the most well-known applications; we can mention, for instance: RE solid-state lasers (from the early Nd:YAG and Nd:glass laser to the high-power Yb:YAG and Yb-fiber lasers); RE-doped fiber and integrated optical amplifiers for optical telecommunications; scintillator materials for high-energy radiation detectors in computerized axial tomography (CAT), positron emission tomography (PET), digital X-ray imaging, and so on; sensing devices (e.g. temperature sensors); energy-efficient luminescent materials (e.g. phosphors for CRT's, plasma displays and fluorescent lamps) and wavelength converting materials, to increase the efficiency of photovoltaic cells or to obtain white light from conventional laser diodes or LED's.

As the number of applications for RE-doped optical materials is keeping to grow, further studies and better understanding of these materials as well as development of suitable processing and diagnostic technologies remain of primary interest. The aim of the second Workshop on *Photoluminescence in Rare Earths: Photonic Materials and Devices* (PRE'07) was indeed to provide a forum for material scientists, chemists and physicists where to debate about the state of the art and the perspectives of the photonic materials based on rare earth ions. The Workshop, promoted by the Italian Society of Optics and Photonics (SIOF) and the Italian Committee COST'01, was held in Trento, Italy, on May 24–25, 2007; the first event in the series had been held in Trento in May 2005.

PRE'07 featured 57 presentations from around the world, in the form of invited, oral and poster contributions. The authors were invited to submit a full paper after the Workshop, and the papers accepted after the standard peer review process are presented in this Special Issue of Optical Materials. It contains 28 refereed papers; several of them deal with the theoretical and experimental investigation of the spectroscopic and optical properties of glasses (6) and crystals (3). Optical amplification is the main subject of five papers, and five more are concerned with the growth and characterization of thin films and nanocomposite or nanocrystalline materials. The effect of laser processing on the activated material or waveguide is discussed in three papers, and five papers are also related to the properties of optical waveguides and photonic crystals. Finally, one paper has to do with the use of rare earths to increase the conversion efficiency of solar cells.

As to the Workshop itself, all the participants were appreciating very much the informal atmosphere, the warm hospitality, and the excellent scientific level. For that we wish to express our sincere appreciation to all the members of the Scientific and Organizing Committees, who very much helped us to assemble a valuable technical program and to smoothly run the Workshop.

Thanks are also due to the Institute of Photonics and Nanotechnologies (IFN – Trento Section), the Nello Carrara Institute of Applied Physics (IFAC), both of the National Research Council of Italy (CNR), the Center for Scientific and Technological Research (now Fondazione Bruno Kessler) in Trento, the Physics Department of Trento University, and the sponsors for their support to the organization of the Workshop. Last, but not least, we wish to thank the Optical Materials Editor, Prof. George Boulon, and the Elsevier staff (in particular Hanna van de Watering) for having offered us the possibility of this Special Issue.

We look forward to a new successful event in September 2009: PRE'09 is under preparation, and the new venue will be Florence, Italy. See you in Florence!

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