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Guest Editor's Introduction

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Understanding the behaviour of complex systems submitted to variations of their environment requires insight into the behaviour of every single constituent of those systems. This inevitably leads to specific phenomena related intrinsically to specific scales.

The motivation behind a special issue in "Fire Technology" dealing with different aspects of "Materials in Fire" was to give, by means of different approaches at different scales, an insightful glimpse into the realm of material behaviour under fire conditions. It is also an attempt to discuss more basic research topics in a technology oriented "fire" journal, and prevent papers dealing with these topics from diffusing into "theoretical" journals with a broad general scope where "fire" is merely a subtopic. As a new member of the editorial board I feel committed to attract papers with multidisciplinary approaches to the notion of "fire".

The four contributions to this special issue show diversity in material, approach and scale, although not exhaustive nevertheless indicative for a large spectrum of unanswered questions. The first paper by Hugi et al. deals with different wood species and the different material properties which have an influence on their charring rate going beyond the simple assumption of the respective standards. Small scale tests to determine thermo-mechanical behaviour and oxygen permeability as well as large scale tests of whole door assemblies with different kinds of wood were used to obtain a broad perspective of wood behaviour in fire. Coquard et al. offer a comprehensive overview on conductive and radiative heat transfer in ceramic and metal foams under fire condition. Here too physical properties such as extinction coefficients and porosities are combined with the structure, i.e. the struts and lumps representing the solid phase of the foam. The analytical predictions are compared to numerical calculations and measurements by the laser flash method showing that the contribution of thermal radiation almost negligible at ambient temperatures becomes significant at fire temperatures and is strongly correlated to the distribution of the solid phase in the foam structure. The third contribution by Frangi et al. takes a phenomenological approach regarding mineral wool as a commonly used insulation material to prevent or postpone a fast temperature increase on the cold side of a testing element. The paper discusses small scale tests resulting in calibration and verification of material properties and quantification of parameters of a new product to be used in finite element numerical analysis. It continues with calculating the coefficients of the design model for tim-

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ber frame wall and floor assemblies containing this new product. Finally, the overview by Gawin et al. addressing the modelling of cement based materials at fire temperatures tackles the interrelation of gas, liquid and solid phases by volume averaging procedure and macroscopic conservation equations. The state of the cement based materials at high temperatures is described by four primary state variables, i.e. gas pressure, capillary pressure (generalized), temperature and displacement vector as well as three internal variables, i.e. degree of dehydration, chemical damage parameter and mechanical damage parameter. This elaborate paper represents a summary of the authors' research activity in the recent years.

I am deeply indebted to all the above authors and their collaborators for the interest and effort to make this special issue possible. My gratitude includes the reviewers who spent generously their valuable time to comment the manuscripts and by doing so guaranteed the maintenance of the scientific standard of "Fire and Technology". Jack Watts wholeheartedly supported my proposal of a special issue with a topic of my own choice.

To L. Schlapbach the former CEO of Empa I do owe the ignition of a fire of another kind, an inner fire which gives the audacity to dare a jump into a new endeavour.