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Quantification of pore size and shape distributions in intumescent coatings chars: effects of heating rate

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Several studies revealed the importance of intumescent char morphology on the performance of these materials in the event of a fire. Results from other scientific fields, such as ceramic and polymeric foams, suggest that this phenomenon can be attributed to the overall porosity, the pore size distribution, and the pore shape.

However, the pore structure in intumescent coating chars has rarely been quantified in detail. The main challenges encountered are related to the low contrast between the solid walls and voids and the unclear distinction between pore body and pore throat. To overcome these problems and record images of the internal structure, the present project uses fluorescent microscopy and a novel algorithm for efficient segmentation of the pore regions. The aim is to employ the approach to study the influence of heating rate on pore size and shape and, thereby, gain a better understanding of the intumescent char growth. Pore size distribution maps, such as the one shown Figure 1, can be obtained.

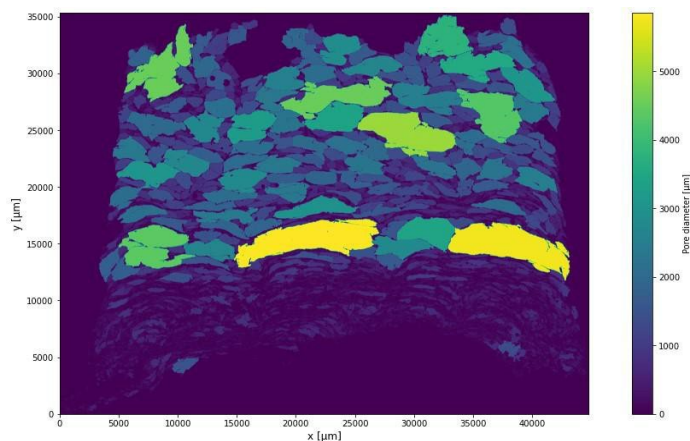


Figure 1 Pore size distribution map of an intumescent coating char fully expanded