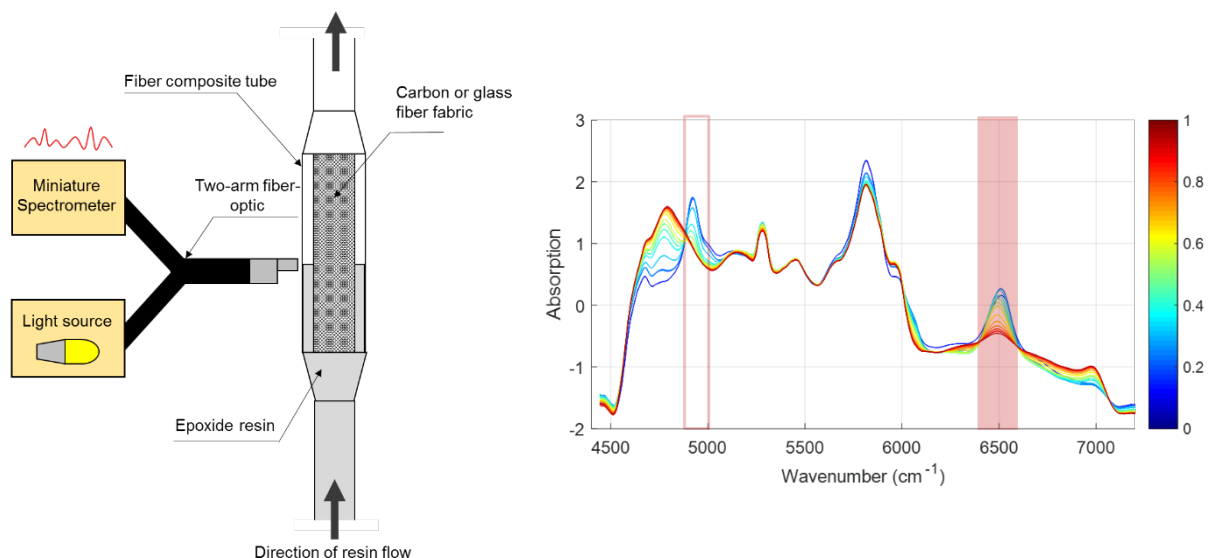


Spectroscopic inline process monitoring of a cascaded injection process for complexly formed fiber-reinforced composite parts

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We present an innovative low-cost approach for inline monitoring of an industrial production process for complexly formed fiber-reinforced composite parts. The investigated process is based on cascade injection of epoxy or polyurethane resin into a moulding tool. The relevant parameters for process control (*detection of the resin flow front*) and quality control (*degree of cure, mixing ratio*) were monitored by NIR spectroscopy. The main part of the setup was a cost-effective and robust MEMS-based *miniature spectrometer*. The spectrometer was coupled to a two-arm fiber-optic, used for delivering light from a halogen light source to the measurement position and collecting the reflected light at the same time. Spectroscopic data were processed using standard methods, including multivariate data analysis.

After an extensive lab phase utilizing a conventional FTNIR spectrometer for method development, the method was then transferred to the actual industrial process and the conventional spectrometer was successfully replaced by the miniature NIR spectrometer.



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