



Factorial Designs and Taguchi Method: Application to the study of light-cured composite resins, using R

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Statistical techniques of experimental design with emphasis on fractional factorial designs with mixed levels are presented and were applied to a real case. Taguchi designs and fractionated factorial designs were obtained with functions of the R packages - AlgDesign and planorR, to analyze the effects on the micro hardness of a composite resin by testing two types of resin and four photopolymerizers in four different depths. The analyses of fractionated designs are compared with the detailed results of a full factorial design. Both techniques identified the important factor settings to ensure the process was improved. Fractional techniques were effective for the analysis of the experiment and showed to be viable alternatives. It was shown that the three factors (resin, photopolymerizers and depth) have significant influence on the micro hardness and from the Taguchi design it was possible to establish a combination of factors and levels which maximizes the micro hardness: these techniques can be used to gain process understanding and to identify significant factors.

Packages and functions for the proposed applications were also investigated and some routines in the R language were developed for the Taguchi method implementation.

Keywords: factorial designs; taguchi method; composit resines.