A pressure vessel for studying gas sorption and synthesis of thermosetting polyurethane foams

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We herein report the design of an apparatus for studying the concurrent chemo-physical processes occurring during gas foaming of thermosetting polymers. In particular, the design of the new pressure vessel relies on two key features. From the processing side, we make use of a rubber impeller to keep the isocyanate and the polyol, the two components for the polyurethane synthesis, separate during gas sorption and allowing for an efficient mixing at the end of the sorption stage. From the analytic side, we utilized a sapphire window beneath the sample holder to use diffuse reflectance near-infrared spectroscopy to measure the amount of sorbed gas and the synthesis reaction under gas pressure. Preliminary results are reported for the polyol-MDI/CO_2 system.

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