Thermosetting polyurethane foams by supercritical CO$_2$ as physical blowing agent

Maria Rosaria Di Caprio$^{a*}$, Ernesto Di Maio$^a$, Sara Cavalca$^b$, Vanni Parenti$^b$, Pellegrino Musto$^c$ and Salvatore Iannace$^d$

$^a$Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale, University of Naples Federico II, P.le Tecchio 80, 80125 Naples, Italy,

$^b$Dow Italia s.r.l, Polyurethanes R&D, via Carpi 29, 42015 Correggio, Italy,

$^c$Institute for Polymers, Composites and Biomaterials, Via Campi Flegrei, 34, 80078 Pozzuoli (Na), Italy

$^d$Institute for Macromolecular Studies, Via Edoardo Bassini, 15, 20133 Milan, Italy

* mariarosaria.dicaprio@unina.it

The aim of the present study was the achievement of thermosetting polyurethane foams by a batch foaming process that uses CO$_2$ as a physical blowing agent. In particular, to address the recent interest in combining the gas (physical) foaming with the classical (chemical) polyurethane foaming, a novel instrumented pressure vessel was designed for investigating: i) sorption under high gas pressure on the two, separate, components of the polyurethane foams, ii) synthesis under high gas pressure after the two components mixing, and iii) foaming upon release of the pressure. Results revealed a significant effect of sorbed CO$_2$ on the polyurethane synthesis and the need for the design of a new chemistry to exploit the use of physical foaming on thermosetting polyurethanes.