Polymer Bulletin (2021) 78:399–413
https://doi.org/10.1007/s00289-020-03114-6

ORIGINAL PAPER

Nano-silica-based urea–formaldehyde composite with some derivates of coumarin as formaldehyde scavenger: hydrolytical and thermal stability

Vojislav Jovanović[1] · Suzana Samaržija-Jovanović[1] · Branka B. Petković[1] · Slaviša Jovanović[2] · Gordana Marković[3] · Slavica Porobić[4] · Milena Marinović-Cincović[4]

Received: 20 October 2018 / Revised: 26 April 2019 / Accepted: 13 May 2019 /
Published online: 25 January 2020

Abstract

The hydrolytic stability of two nano-SiO_2-based UF composites with derivates of coumarin (names as K-1 and K-2) was investigated. K-1 is 3-nitro-4-(*p*-tolylamino)-2*H*-chromen-2-one and K-2: 4-((3-nitro-2-oxo-2*H*-chromen-4-yl)amino)benzenesulfonamide. Two types of nano-silica-based urea–formaldehyde (UF), composite materials with a formaldehyde-to-urea (F/U) ratio of 0.8, were synthesized (UF/K-1/SiO_2, and UF/K-2/SiO_2). The hydrolytic stability of modified UF composite was determined by measuring the mass loss and liberated formaldehyde concentration of modified UF composite after acid hydrolysis. Obtained results showed that the hydrolytic stability of modified resins with derivates of coumarin was enhanced. The formaldehyde emission of modified UF/K-1/SiO_2 composite is lower compared with UF/K-2/SiO_2 composite. The thermal behavior of materials was studied by non-isothermal thermo-gravimetric analysis and differential thermal gravimetry supported by data from ATR-IR spectroscopy. The shift of temperature values for selected mass losses (T_5%) to a high temperature indicates the increase in thermal stability of samples based on UF resin modified with K-2.

Keywords Hydrolytic stability · Nano-SiO_2 · Derivates of coumarin · Formaldehyde emission · Thermal behavior

✉ Suzana Samaržija-Jovanović
vojani@sbb.rs; suzana.samarzija@pr.ac.rs

✉ Milena Marinović-Cincović
milena@vinca.rs

Extended author information available on the last page of the article