Applicability of samarium(III) complexes for the role of luminescent molecular sensors for monitoring progress of photopolymerization processes and control of the thickness of polymer coatings

Monika Topa, Joanna Ortyl, Anna Chachaj-Brekiesz, Iwona Kamińska-Borek, Maciej Pilch, Roman Popielarz

PII:	S1386-1425(18)30245-2
DOI:	doi:10.1016/j.saa.2018.03.050
Reference:	SAA 15922
To appear in:	*Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*
Received date:	30 November 2017
Revised date:	22 February 2018
Accepted date:	15 March 2018

Please cite this article as: Monika Topa, Joanna Ortyl, Anna Chachaj-Brekiesz, Iwona Kamińska-Borek, Maciej Pilch, Roman Popielarz , Applicability of samarium(III) complexes for the role of luminescent molecular sensors for monitoring progress of photopolymerization processes and control of the thickness of polymer coatings. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Saa(2017), doi:10.1016/j.saa.2018.03.050

Applicability of samarium(III) complexes for the role of luminescent molecular sensors for monitoring progress of photopolymerization processes and control of the thickness of polymer coatings.

Monika Topa[1], Joanna Ortyl[1,3*], Anna Chachaj-Brekiesz[2], Iwona Kamińska-Borek[1], Maciej Pilch[1], Roman Popielarz[1]

[1] Faculty of Chemical Engineering and Technology, Cracow University of Technology, Warszawska 24, 30-155 Cracow, Poland, jortyl@chemia.pk.edu.pl

[2] Faculty of Chemistry, Jagiellonian University, Ingardena 3, 30-060 Cracow, Poland

[3] Photo HiTech Ltd., Life Science Park, Bobrzyńskiego 14, 30-348 Cracow, Poland

Abstract

Applicability of 15 trivalent samarium complexes as novel luminescent probes for monitoring progress of photopolymerization processes or thickness of polymer coatings by the Fluorescence Probe Technique (FPT) was studied. Three groups of samarium(III) complexes were evaluated in cationic photopolymerization of triethylene glycol divinyl ether monomer (TEGDVE) and free-radical photopolymerization of trimethylolpropane triacrylate (TMPTA). The complexes were the derivatives of tris(4,4,4-trifluoro-1-(2-thienyl)-1,3-butanedionate)samarium(III), tris(4,4,4-trifluoro-1-phenyl-1,3-butanedionate)samarium(III) and tris(4,4,4-trifluoro-1-(2-naphthyl)-1,3-butanedionate)samarium(III), which were further coordinated with auxiliary ligands, such as 1,10-phenanthroline, triphenylphosphine oxide, tributylphosphine oxide and trioctylphosphine oxide. It has been found that most of the complexes studied are sensitive enough to be used as luminescent probes for monitoring progress of cationic photopolymerization of vinyl ether monomers over entire range of monomer conversions. In the case of free-radical polymerization processes, the samarium(III) complexes are not sensitive enough to changes of microviscosity and/or micropolarity of the medium, so they cannot be used to monitor progress of the polymerization. However, high stability of luminescence intensity of some of these complexes under free-radical polymerization conditions makes them good candidates