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TurboVap LV Multi racks allow a larger selection of tubes and vials to be evaporated from one rack based upon outer vial dimension. This saves storage space at a your facility and also negates the need for custom racks to fulfill non-standard vials designs. Evaporation of up to 48 samples in tubes ranging from 10-16 mm (outer diameter), less than or equal to 45 mm in length, 10-20 mm (outer diameter), ranging from 75-165 mm in length. When operating in 24 position mode (by plugging 24 nozzles) the system can parallel process samples in tubes ranging from 12-30 mm (outer diameter), ranging from 75-165 mm in length. Independent row control (6 rows of 8 nozzles each). 12 August 2022Dr. Thomas Lee, Chief Medical Officer, Press Ganey Associates, LLC, presents an overview of his plenary talk on the importance of building trust in healthcare, as presented at the 2022 AACC Annual Scientific Conference and Clinical Lab Expo in Chicago. In this talk, Lee explains why building trust is highly relevant to laboratory professionals, especially during times of turmoil. Lee presents a practical 3-point plan to enable healthcare providers to build trust, reducing any unnecessary anxiety and mistrust that may be felt by patients and the wider community. This interview has been shared from The Scientist's Channel. Advertisement Advertisement Advertisement A novel treatment and derivatization for quantification of residual aromatic diisocyanates in polyamide resins In the scientific context, the environmental and healthy impact of polymers is more related to the residual monomer content rather than their macromolecular structure, due to the monomer capability to interact with membrane cells. For this a novel method to stabilize and quantify residual monomeric isocyanates in high thermal resistance polyamide resins (PAs) has been developed. This new analytical method residual aromatic diisocyanates in viscous polymeric matrices by using a simple and cheap technique like HPLC-VWD. Diisocyanate monomers were derivatized with dibutylamine, resulting in stable urea derivatives that were simultaneously analysed and quantified. The method was applied to solvent-based polyamide resins, used as primary electrical insulation, for avoiding additional step of solvent removing before the analysis. The quantification of residual monomers answers to the provisions imposed by European Regulation N. 1907/2006 (REACH) for polymer registration, and the necessity of an early evaluation of the occupational risk associated with the use of diisocyanates, due to their toxicity and high reactivity towards moisture. Polyamides (PAs) are versatile products for a broad range of commercial applications due to their unique thermal, mechanical, and electrical properties 1. Such polymeric materials are among the most important and useful thermoplastics made from monomers capable of giving linkages in the main polymer chain that provide mechanical strength and barrier properties 2. They are important in engineering because they offer high performance at a reasonable cost, and then they are considered as one of the most versatile engineering plastics. The polyamide resins under investigation are synthesized from conventional condensation polymerizations, which proceed through a step-growth mechanism of para-substituted AB-type aromatic monomers 3. They show the ability to control molecular weights and dispersities of condensation polyamides, and in particular they are prepared from a variety of aromatic diisocyanates (DIs) and therephthalic acid in a polar aprotic solvent (N-methylpyrrolidone, NMP) as shown in Fig. 14,5,6. The attractive features of this reaction include (1) the use of reactants which are tolerant of small deviations in stoichiometric equivalence, (2) easy remove of the volatile condensate such as carbon dioxide, (3) high yields of polymer, and (4) generation of a wide range of aromatic polyamides. Figure 1 General scheme for polyamide synthesis. The most common diisocyanates used are the mixture of isomers 2,4-, 2,6-toluene diisocyanates (TDI) and 4,4'-methylene diphenyl diisocyanate (MDI), which are both aromatic. The final product is a solvent-based varnish with a viscosity range between 1000 and 3000 mPa•s, which is applied and cured at high temperature on copper wires. (Fig. 2). MDI and TDI have different chemical behaviour and confer different mechanical properties to the final product. They can be used separately, but also as a combination of the two.Figure 2Schematic representation of the general coating process. The industrial polymerization process. The industrial polymerization of the general coating process. The industrial polymerization of the same time, European Regulation N. 1907/2006 (REACH) imposes to the companies the registration of residual monomers, if they are present in concentration over 2% w/w, and if the monomers amount is totally over 1 ton per year. This legal obligation goes together with the ethical obligation to evaluate the residual TDI or MDI, due to their toxicological issues: isocyanates exposure is associated with occupational hazards7,8,9. In fact, in the case of wire enamel polyamides, wire enamelling workers are those who are potentially at risk to diisocyanates exposure during the curing process which occurs at high temperatures during the normal production activities10. In addition, residual aromatic diisocyanates react with moisture, which is always present in hygroscopic solvents, giving rise to many products, including urea, oligoureas, polyureas, carbon dioxide, and are listed as suspected or possible human carcinogens13,14,15. These residual aromatic amines, 4,4'-methylenedianiline, could decompose with

formation of aniline when heated at high temperatures in enamelling ovens during the curing process2. Work-related exposure to DIs can occur during the products, especially in the activities concerning the general coating process which is performed at high temperature. Understanding the degradation mechanism of polymeric materials that could lead to the formation of dangerous products for the environment is particularly useful in combating the global problem of polymer-matrix composite materials that could lead to the formation of residual monomer content is a priority as residual monomers. can result in increased hazards while representing decreased production efficiency and increased costs. It should be noted that when these low molecular weight species are considered, residual monomer must be included, but excluding other components such as additives or impurities 17. Most of the scientific literature concerning diisocyanates analysis, covers the determination of them in air in industrial environments18,19,20. Numerous methods were published that detail isocyanates analysis in polymer matrices by using fast infrared spectroscopic techniques, such as MIR and NIR21, but these methodologies are widely used to monitor high concentration of diisocyanates, so they are not suitable for PAs due to the low concentration of residuals. Another interesting analytical technique is the nuclear magnetic resonance technique is the nu (gNMR) proves to be inaccurate due to the matrix complexity. Suitable techniques for very complex matrices, which allow determining such a low concentration of analytes, are chromatographic ones23. In the most suitable scientific paper found for the case under study, the authors used two techniques to determine MDI in a polyurethane foam matrix24: reversed-phase high performance-liquid chromatography coupled with mass spectrometry triple quadrupole detector (HPLC-ESI-MS/MS). The first is widespread and easy to use technique, the latter gives a more specific response, but it is more expensive and complex. Since all the aforementioned articles refer to solid or foam polyurethane samples, we were not aware of any existing method for the determination of residual MDI and TDI monomers. Consequently, answering to the legal and ethical obligations, we developed and applied a novel derivatization and extraction method for the entire production process. This new method can detect free monomeric diisocyanates in the order of part per million in a polymer matrix never faced so far by using a simple and cheap technique like HPLC-VWD. The 4,4'-methylene dijsocyanates (TDI) were provided by Elantas Europe S.r.l. and stored at - 18 °C. Reagent grade triethylamine (TEA), benzylamine (BA) and dibutylamine (DBA) were purchased from Sigma Aldrich. Acetone-d6 was purchased from Sigma Aldrich. HPLC water was purified using the Milli-Q system. HPLC grade acetonitrile and n-hexane were purchased from Sigma Aldrich. HPLC water was purified using the Milli-Q system. purchased from Sigma Aldrich. Three batches of PA were provided by Elantas Europe S.r.l. Samples have a mean viscosity of 1100 mPa s and a mean dry content of 22.9% (solvent used is NMP). Three samples were chosen corresponding to three batches produced over a year (Table 1). One batch was marked as anomalous as slightly greater quantities of MDI and TDI were added during the condensation step of the synthesis process to achieve final specifications. Table 1 PAs sample provided by Elantas Europe S.r.l. The molecular structures of the standards were confirmed by 1H-NMR, recorded on a Varian Mercury plus 400 system at 400 MHz25, 26. Standard preparation DIs derivatives were synthesized using a Perveen et al. adapted method27. Specifically, the monomer (10 mmol) was dissolved in 30 mL of dry THF under nitrogen flow added dropwise followed by the addition of dry triethylamine (12 mmol). Next, the reaction was stirred for 30 min at 0 °C and additional 30 min at 25 °C. The reaction product precipitated as a white solid due to its insolubility in THF. It was filtered and dried under vacuum. The residual white solid was purified by flash column chromatography (hexane:ethyl acetate 60:40) using Isolera[™] (Biotage). Derivatization of analytes were conducted under anhydrous condition due to the strong reactivity of DIs with water. Both MDI and TDI were derivatized with two different amines, benzylamine (BA) and dibutylamine (BA), to evaluate which resulting urea had an elution time such as not to overlap with the components of the matrix. In particular, MDI/BA-3 were obtained from MDI monomer, meanwhile TDI/BA-2 and TDI/DBA-4 were produced starting from TDI monomer (Table 2). The purity of the synthesized standards was evaluated by HPLC-VWD at 254 nm. Table 2 DIs derivatization product obtained with benzylamine and dibutylamine. Sample preparation product obtained with benzylamine and dibutylamine. (1 mL) and triethylamine (0.5 mL) were added dropwise at room temperature to avoid polymer precipitation. The sample was left to react under stirring for 12 h. Hexane (5 mL) and acetonitrile (10 mL) were added to precipitate the polymer avoiding the risk of clogging the instrumentation or altering the analytes. The mixture was stirred for 12 h and then left still for 1 h allowing the separation of the liquid phase (containing analytes) from the polymer matrix. This procedure was repeated for all real samples, maintaining under vigorous stirring. Then, an aliquot of 1 mL of the resulting solutions was filtered before HPLC-VWD analysis (Agilent[™] PTFE filters 0.450 µm).HPLC-VWD analysisThe analysis was carried out by a HPLC apparatus (HPLC Agilent 1100 series, Agilent Technologies, Santa Clara, California, USA) using a Variable Wavelength Detector (VWD) detector set at 254 nm. The chromatographic separation was performed by using Luna column (C18, 150 × 4.6 mm) with 5 µm particle diameter (Phenomenex, Castel Maggiore, BO, Italy) and a temperature of 40 °C. The mobile phase was composed of solvent A, water and solvent B, acetonitrile according to an optimized gradient was not linear: 0 min, 70% B, 20-40 min 80% B, 40-60 min 80% B, 40-60 min 80% B, then the starting conditions were restored. The flow rate was set to 1 mL min-1, the injection volume was 10 µL. The linearity was tested in the range 0.2-10 mg/l for MDI, and 1-40 mg/l for MDI, and 1-40 mg/l for MDI, and 1-40 mg/l for MDI and TDI respectively. Sensitivity was determined on the base of the limit of detection (LOD) and limit of quantification (LOQ). The LOD was assessed as the concentration at which the signal (S) to noise (N) ratio is equal to three, instead the LOQ is associated to S/N = 10. MDI has 0.2 mg/l and 0.2 mg/l as LOD and LOQ respectively. TDI has 0.2 mg/l as LOD and LOQ respectively. TDI has 0.2 mg/l as LOD and LOQ respectively. TDI has 0.2 mg/l as LOD and LOQ respectively. TDI has 0.2 mg/l as LOD and LOQ respectively. TDI has 0.2 mg/l as LOD and LOQ respectively. TDI has 0.2 mg/l as LOD and LOQ respectively. TDI has 0.2 mg/l as LOD and LOQ respectively. real samples obtaining standard deviation in the range of 2.8-31.9%. Accuracy was calculated on the base of the recovery values obtained by the analysis of the real sample as it is, and the same sample spiked with a known amount of MDI and 54.1% for TDI.DI compounds have reactive -NCO functions that must be stabilized before the HPLC-VWD analysis, giving rise to the necessity of derivatization for quantifiable 28. The advantages to perform the derivatization step were the increasing of the solubility in the HPLC mobile phase of derivatives, that is related to the chemical nature of the derivatization agent, and the improving of the chromatographic efficiency, avoiding coelution with components of the matrix. The latter is particularly important when a non-specific detector like UV is used. In this work two different amines were tested: an aromatic one such as BA, and an aliphatic amine like DBA. BA had the adding value of increasing the respondent derivative at the detection wavelength, due to the presence of an additional aromatic moiety able to respondent derivative at the detection wavelength. had the advantage to improve the derivative solubility in the mobile phase. BA and DBA derivatives were synthetized and purified in our laboratories, then their solubility in the eluent solution constituted by acetonitrile and water at a concentration of 1 mg/ml. The poor solubility could be explained due to presence of about 78% of NMP (NMP solvent for PAs matrixes). A subsequent step was testing the urea derivatives in the chromatographic condition in the presence of the matrix to evaluate detrimental overlap with matrix components. Urea TDI/BA-2 demonstrated to coelute with interfering species and cannot be used for quantitative purposes using UV detector system. Instead, both DBA derivatives of MDI and TDI revealed a good solubility in the mobile phase and retention times compatible with none of other signals coming from the matrix. For this reason, the PA samples were derivatized with DBA. In Fig. 3 is reported the overlay of chromatograms belonging to a standard mixture at 10 mg/l and a real sample. As can be seen, MDI-DBA have retention times of 24.7 and 32.4 min respectively, and their elution occur in correspondence of a chromatogram region without signals related to the matrix. Figure 30verlay of a standard mixture (red line) and a real sample (green line) chromatograms. Sensitivity is a crucial point for the quantification of residuals in complex matrices, specially when a derivatization step is necessary. In this case, sensitivity can be improved by different approaches: optimization of the derivatization yield, use of a chromophore able to increase the analyte detectability, achievement of a clear separation between derivatives and the matrix composition. The LOQs of MDI reported in literature24 are 33.5 mg/l for HPLC-UV and 1.65 mg/l for HPLC-UV and 1.6 species are clearly separated from the matrix components, originating signal to noise ratios similar to the standards matrix-free solutions. This fact could be addressed as the driving force to increase sensitivity and quantify very low level of MDI and TDI in solved-based varnish samples. In addition, the derivatization process occurs in high controlled anhydrous conditions, improving the derivatizing yields. Finally, variable wavelength detector (VWD) is the most sensitive among the UV detectors, even if we cannot have any confirmation of the analyte identity except for its retention time. Thus, all the listed precautions resulted in high level of sensitivity. DIs quantification in PAs samples The developed analytical method was applied to PA samples manufactured by Elantas Europe S.r.l. company. Three batches produced in different seasons were analysed in order to evaluate the residual monomers MDI and TDI, in addition to the reproducibility of the industrial polymerization reaction. In fact, the high reactivity of DIs, especially in the presence of moisture in the reaction solvent, gave rise to a lack of standardization of the polymerization process. For this reason, it is a common practice to follow the polymerization process, is under the stated specification, higher amount of monomers is used by subsequent addition. This is the case of the PA1 sample belonging to the batch produced in August 2020, that is labelled as anomalous. On the contrary, PA2 and PA3 samples were the results of a standard process. The results are reported in Table 3. Analyses revealed a residual amount of MDI in the range 0.3-1.7 mg/kg. Instead, higher concentrations of TDI monomers used during the process didn't affect the quantity of residual monomers. Moreover, the residual monomers were largely lower of 2% w/w in all analysed samples, that avoid the registration activities according to the REACH Regulation. Table 3 Concentration of MDI and TDI in real PAs samples expressed in mg/kg. In the present manuscript we developed a new and general analytical method able to determine residual monomeric aromatic isocyanates in many consumer products in which one of their primary raw material ingredients are diisocyanates. Although identifying and quantifying the content of aromatic isocyanates would be possible by several analytical methods, but each is highly specific and is labour intensive and expensive. Our method allows to analyse easily and quickly the common aromatic used-diisocyanates, such as toluene diisocyanate (TDI) and methylene diphenyl diisocyanate (MDI). For the first time, the optimized analytical method revealed good accuracy and precision over the concentration range 0.3-1.7 mg/kg of TDI resulting from the analysis of PAs real samples thanks to the derivatization method studied, through which it is possible to extract the analytes from the polymer matrix and analyze them. The results obtained from this analysis indicate that the batch where an additional amount of monomers were added during the production process (labelled as anomalous) does not prove to have an abnormal concentration of diisocyanates compared to the other batches. In addition, there is no evident correlation between the storage time of the batch and the concentration of residual monomers in it. Therefore, it is logical to think that this new analytical method could be useful for further monitoring of the early-stage production in similar matrices as solvent-based polyamide-imides (PAIs) and polyamic acids (PAAs) which are easily synthesized by polycondensation of aromatic diamine with dianhydride, in order to avoid any hazard due to the high temperature used for their production in a "one-health" point of view. Furthermore, even more important is that the method finds application in viscous polymeric matrices, and therefore it suggests its use for the determination of residual isocyanates in medical devices29. In these consumer products are required since isocyanates react instantly with skin components. The method was studied for aromatic isocyanates it is known that they are much more dangerous than the aliphatic correspondents 30. 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