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Direct determination of N-Nitorsodiethanolamine (NDELA) in Ethanolamines by LC-MS-MS

George Kuriakose
SABIC, King Saud University, Saudi Arabia

Abstract

N-Nitrosodiethanolamine(NDELA) is produced, when an amine or amino derivative comes in contact with nitrosating agents such as nitrous acid, nitrites or oxides of nitrogen. NDELA have long been recognized as a class of hazardous compounds. “UK Department of Trade and Industry categorizes nitrosamine as more toxic in more animal species than any other category of chemical carcinogen”. Ethanolamines are mainly used in personal-care products, detergents and one of the potential contaminant is NDELA. As considering the toxicity of NDELA, parts per billion levels quantification of NDELA in ethanolamine is very critical to serve customers across the globe. Various analytical methods have been developed for determination of NDELA including GC-MS, GC-TEA, HPLC-TEA and HPLC-PHRED etc... Most of these methods require post column derivatization with toxic chemicals, time intensive clean up procedures. Otherwise it is easy to generate false negative or positive results.

We have developed and validated a liquid chromatography and mass spectrometry (LC-MS-MS) method for direct determination of N-nitrosodiethanolamine (NDELA) in ethanolamines. The sample is diluted with water and directly injected to the column. Ion suppression in the MS system is minimized by using special ion exchange columns. MRM mode is used to get the good sensitivity and repeatability of the method. LoD and LoQ of this method is 1ppb and 5 ppb with recovery range of 97-105 %. NDELA in mono/di and triethanolamine, were quantified up to 5 ppb level. Six sigma methodologies were used to develop and validate this method.

Biography

Dr. George Kuriakose has obtained his doctorate from Bangalore University, India and completed postdoctoral studies from GE Technology Center (JFWTC). He is currently a lead scientist in SABIC Technology & Innovation, Analytical department, Riyadh. He has coauthored over 10 publications in International Journals. He holds two US patents. His current research interests are analytical method development in chromatography area and specialized in liquid chromatography and mass spectrometry.