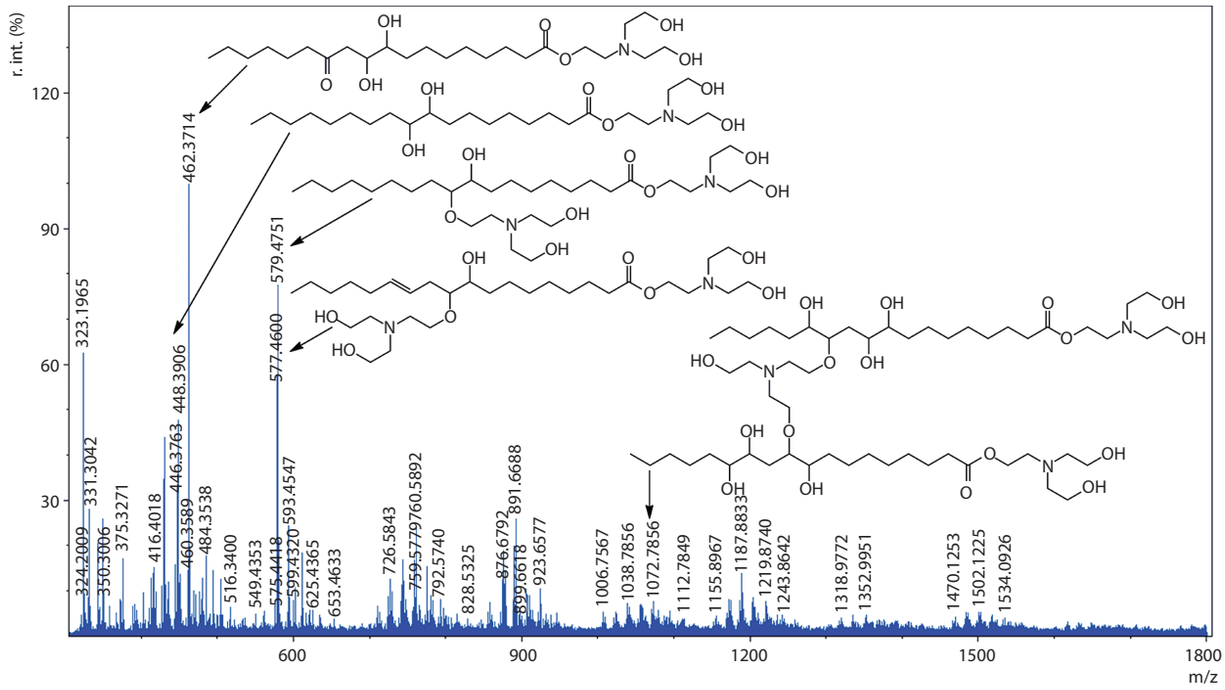

Figure 8 Positive ion MALDI-TOF MS spectra of ETOFA/TEOA polyol.

seems to occur. Wide scatter of molecular weight can be explained by various mutual reaction combinations of different types of fatty acids and their derivatives during the epoxidation and functionalization stages.

From the given MALDI-TOF MS spectra 80 different compounds were identified by the relevance of theoretical and determined molecular ion mass. Individual functionalities of these compounds vary from 2 up to 14 OH groups per molecule. Average functionality of ETOFA/TEOA polyol was estimated according to the following equation:

$$f = \sum\left(\frac{I_n}{\sum I_n} f_n\right); \quad (4)$$

where f is average functionality of polyol; I_n is signal intensity of identified compound; ΣI_n is sum of all identified compound signal intensities; and f_n is functionality of an identified compound.

The average molecular weight of polyol was estimated according to the following equation:

$$M = \sum\left(\frac{I_n}{\sum I_n} M_n\right) \quad (5)$$

where M is average molecular weight of ETOFA/TEOA polyol, Da; and M_n is molecular weight of identified compound, Da.

Average molecular weight and functionality of ETOFA/TEOA polyol are summarized in Table 1.

4 CONCLUSIONS

The results of this work show that free tall oil fatty acids can be epoxidized with a relative conversion to oxirane of 44% and epoxidation selectivity of 56% using *in-situ* formed peracetic acid. The highest degree of epoxidation with 3.98% oxirane oxygen content was noted when the temperature of the reaction medium was 60 °C, the molar ratio of C=C/EtOOH/H_2O_2 was 1/0.5/1.5 and a catalyst (*Amberlite IR-120*) amount of 20% of TOFA.

The ETOFA was subsequently functionalized under solvent-free conditions with TEOA; acidic clay (*Montmorillonite K10*) was used as an oxirane ring opening catalyst. As a result, highly functional biobased polyol ETOFA/TEOA was obtained with an average functionality of 6.2, OH value of 527 ± 2 mg KOH/g, the viscosity of 5.64 ± 0.04 Pa s and average molecular weight of 649 Da. The synthesized polyol is an attractive intermediate for the polyurethane processing.

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