Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Fire-resistant tannin-ethylene glycol gels working as rubber springs with tuneable elastic properties

C. Delgado-Sánchez[1], G. Amaral-Labat[1,2], L.I. Grishechko[1,3], A. Sánchez -Sánchez[1], V. Fierro[1], A. Pizzi[4,5], A. Celzard[1*]

[1] Institut Jean Lamour - UMR Université de Lorraine – CNRS n°7198. ENSTIB, 27 rue Philippe Séguin, BP 21042, 88051 Épinal cedex 9, France

[2] University of São Paulo, Department of Metallurgical and Materials Engineering PMT-USP, Avenida Mello Moraes, 2463-Cidade Universitária, CEP 05508-030, - São Paulo, SP – Brazil

[3] Institute of Chemistry and Chemical Technology, SB RAS, 50/24, Akademgorodok Street, Krasnoyarsk 660036, Russia

[4] LERMAB, Université de Lorraine, 27 rue Philippe Séguin, BP 21042, 88051 Épinal cedex 9, France

[5] Dept. of Physics, King Abdulaziz University, Jeddah, Saudi Arabia

[*] Corresponding author. Tel: + 33 372 74 96 14. Fax: + 33 372 74 96 38. E-mail address : alain.celzard@univ-lorraine.fr (A. Celzard)

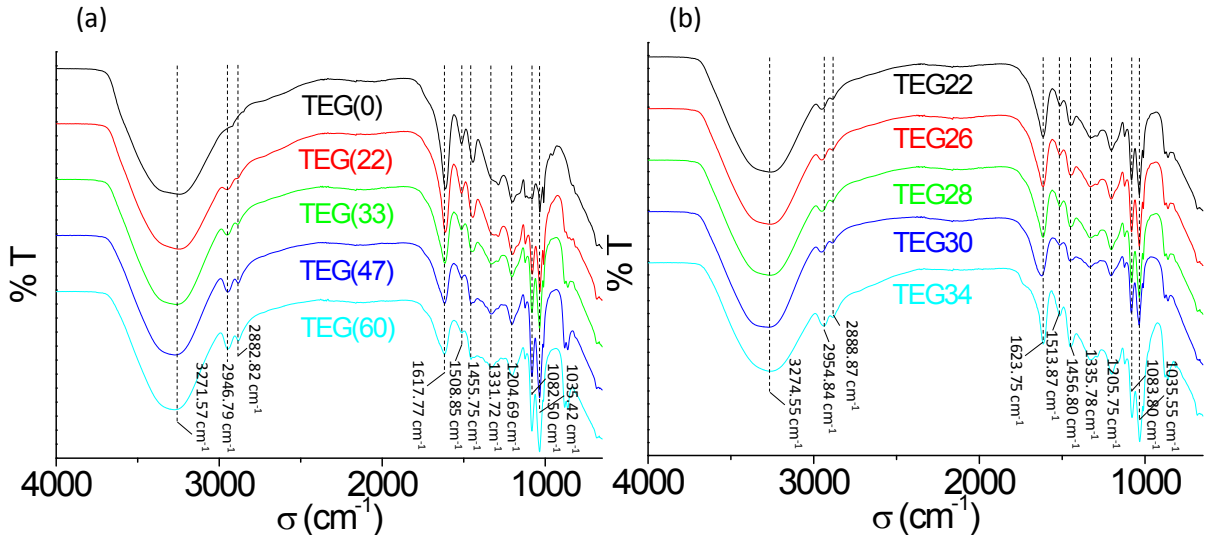
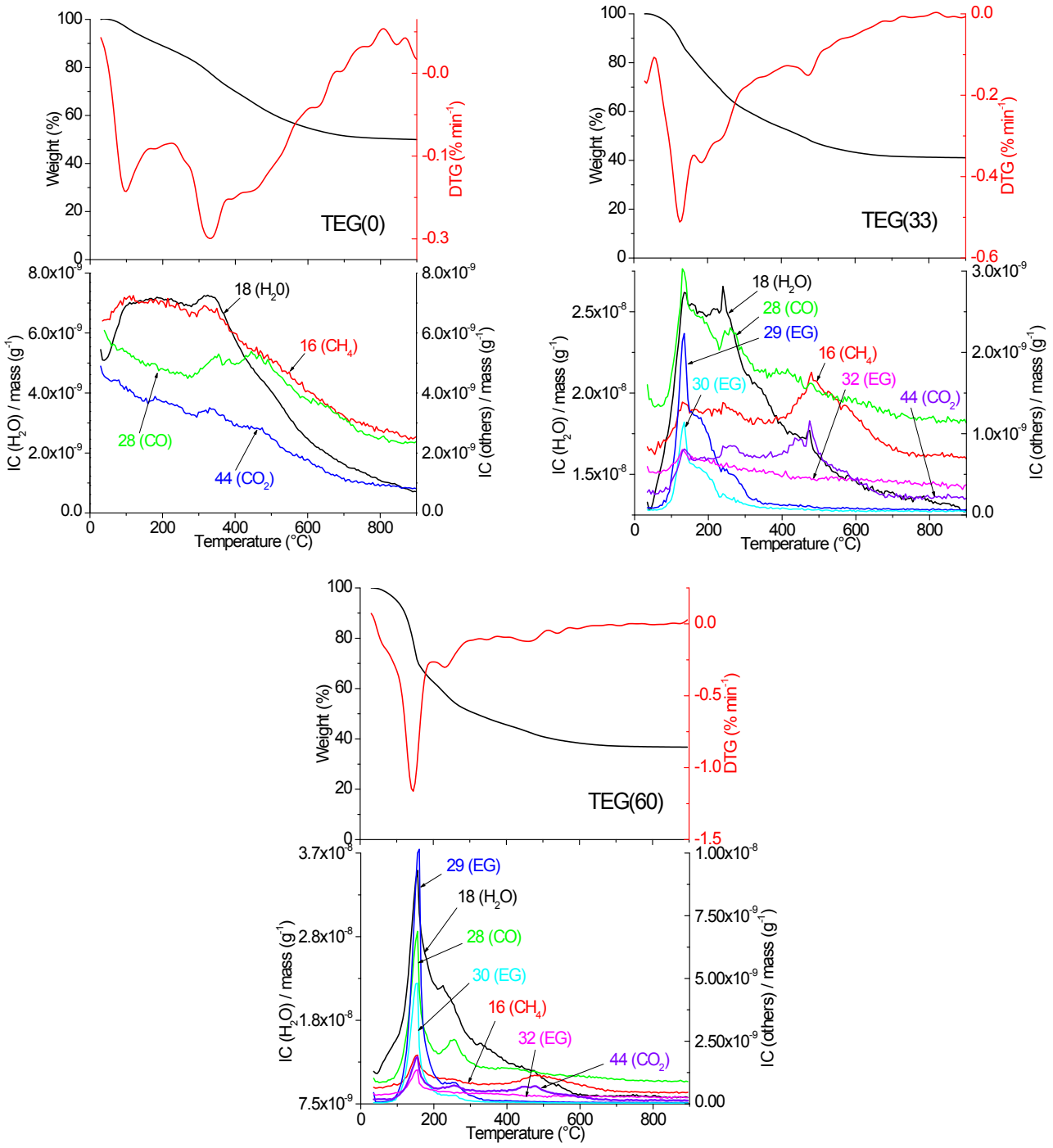


Figure S1. FTIR spectra of the two series of elastic gels: (a) TEG(x) ; (b) TEGy.

(a)


TEG(0)
Weight (%)
DTG (% min-1)
IC (H2O) / mass (g-1)
IC (others) / mass (g-1)
18 (H2O)
16 (CH4)
28 (CO)
44 (CO2)
Temperature (°C)
TEG(33)
29 (EG)
30 (EG)
32 (EG)
TEG(60)

(b)

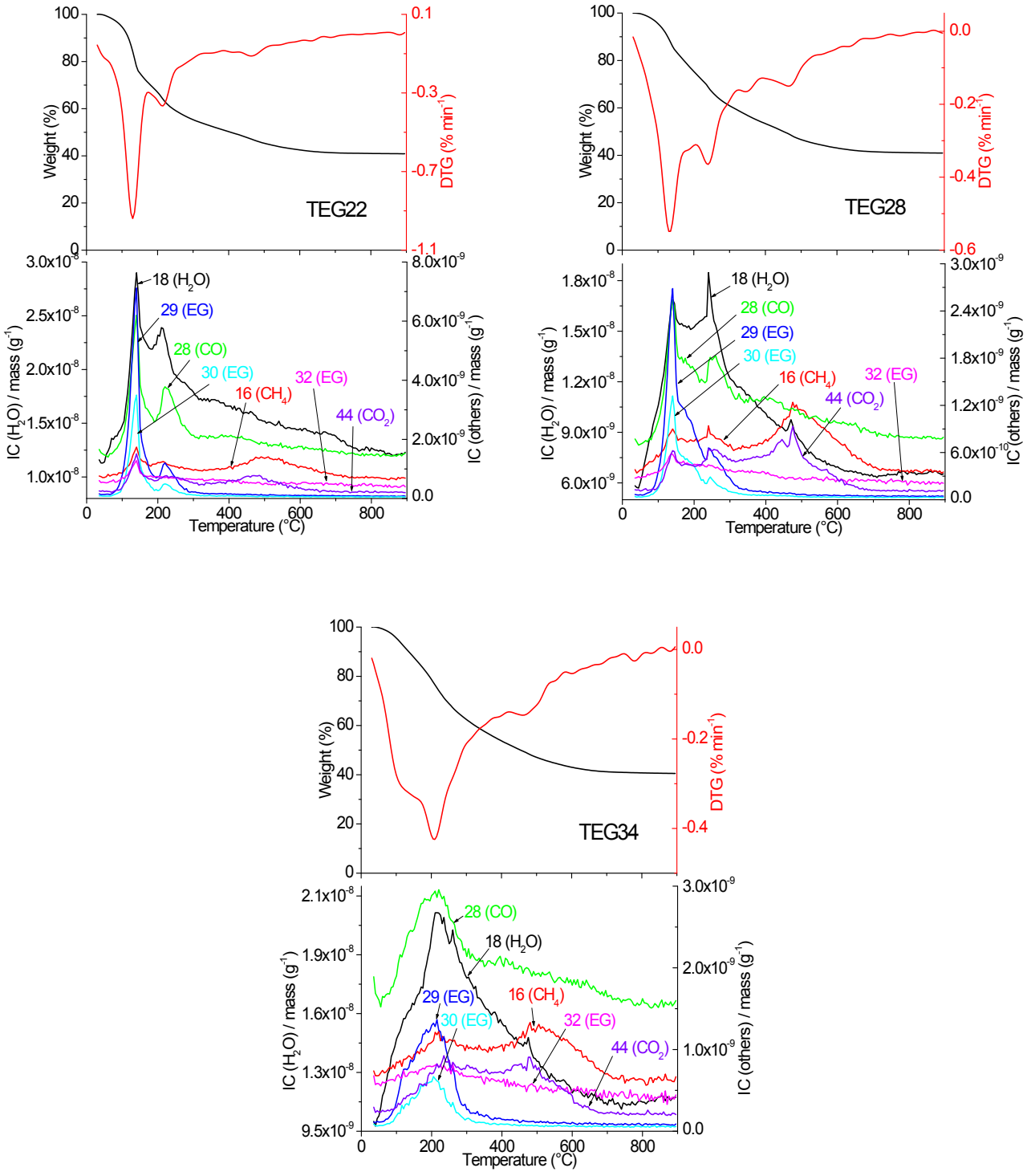


Figure S2. TGA curves (top graphs) and corresponding mass spectrometry data corresponding to the evolution of the main compounds and molecular fragments, shown as *m*/*z* values together with the corresponding molecules from which they are derived (bottom graphs): (a) Samples from the TEG(x) series; (b) Samples from the TEGy series. The mass spectrometry data are presented in units of ionic current (IC) per unit weight measured by the detector without calibration with respect to pure gas streams.

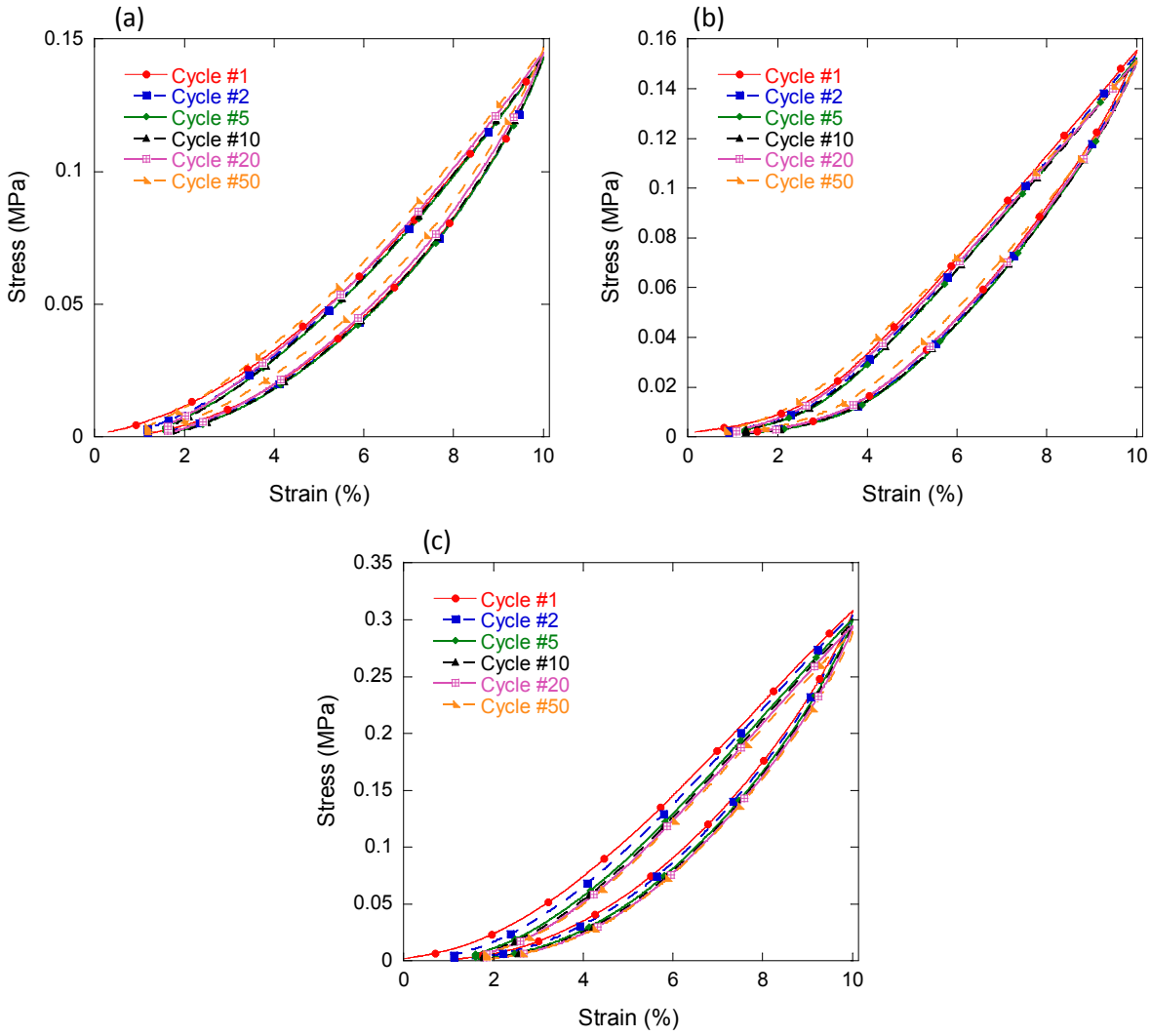


Figure S3. Same as Figure 12 but for samples from the TEGy series: (a) TEG22; (b) TEG26; (c) TEG30.

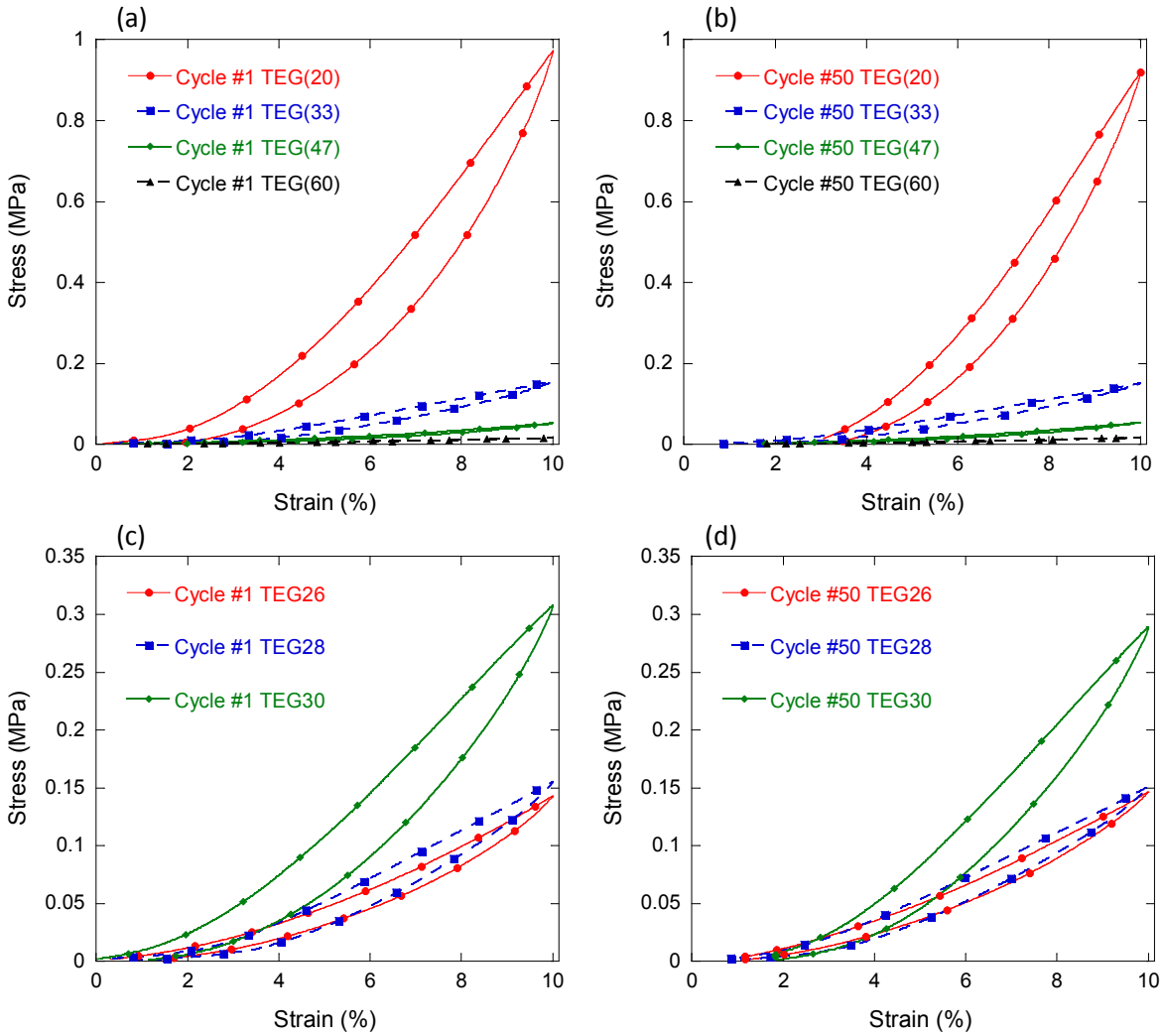
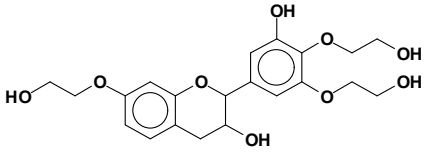


Figure S4. (a) and (c): 1st compression curves, and (b) and (d): 50th compression curves of samples from: (a) and (b) TEG(x) series, and (c) and (d) TEGy series.

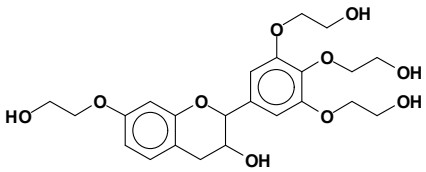
Table S1. MALDI TOF interpretation of the chemical species formed in sample TEG26. The repeating periods observed are 43 Da.

---

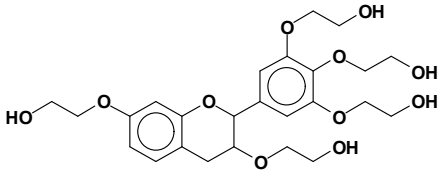
423 Da



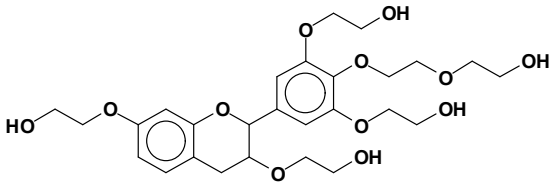
467 Da



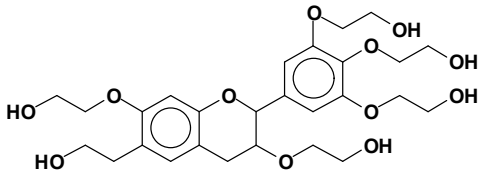
511, monoprotonated = 512 Da



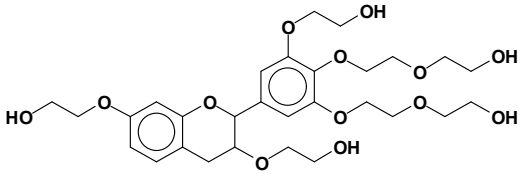
555 Da



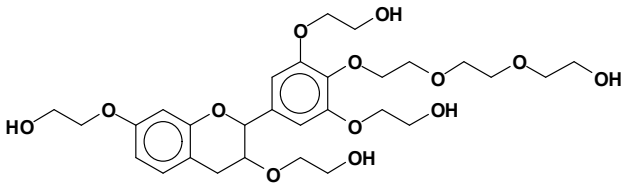
and



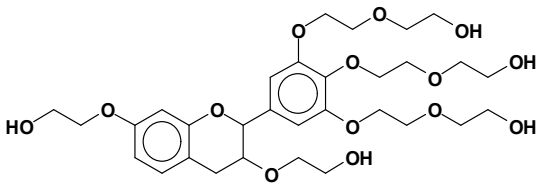
599 Da



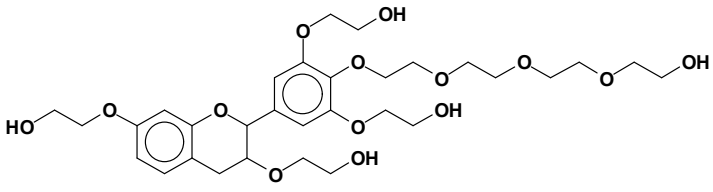
and



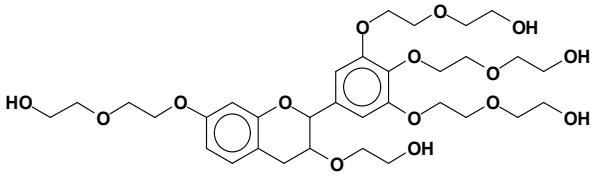
642 Da



and



686 Da



and

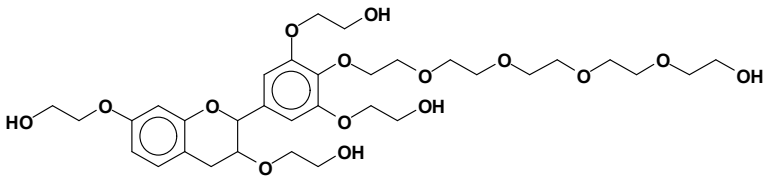
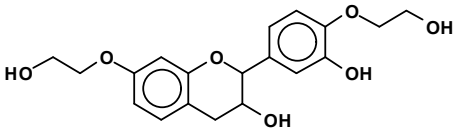
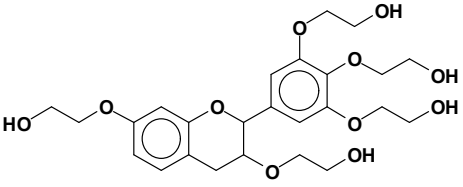


Table S2. MALDI TOF interpretation of the chemical species formed in sample TEG28.

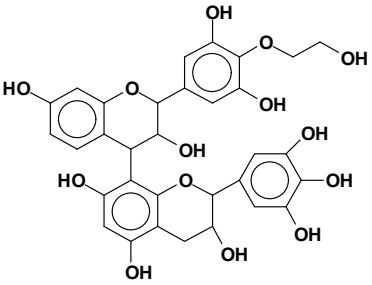
401 Da = robinetinidin monomer + 2 ethylene glycol + Na^+



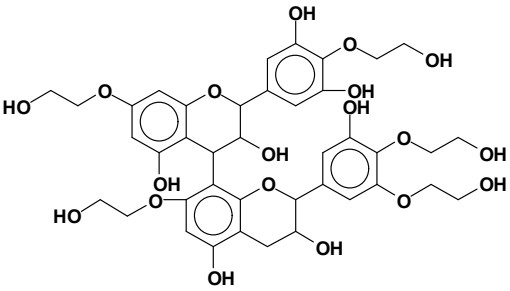
514 Da (511 calculated) thus protonated



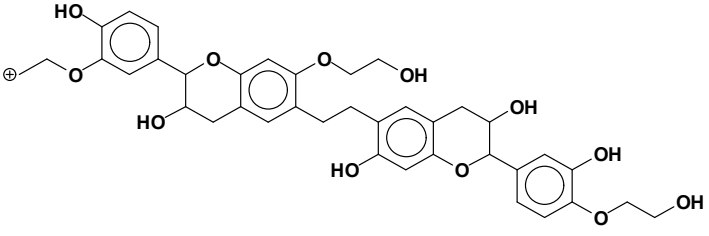
547 Da = fisetinidin dimer without Na^+ (not reacted with ethylene glycol)
563 Da = fisetinidin-robinetinidin dimer without Na^+ or fisetinidin-catechin dimer
639-640 Da = robinetinidin + gallocatechin dimer + 1 ethylene glycol without Na^+



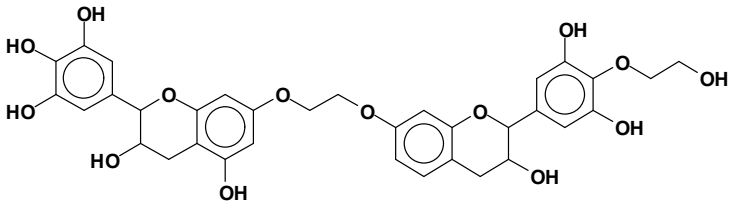
830-831 Da = gallocatechin dimer + 5 ethyleneglycols without Na^+



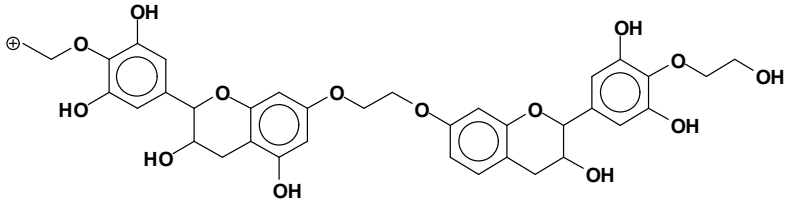
689 Da = carbocation present, without Na^+



or with Na^+ = 689 Da



or without Na^+



1022-1023 Da with Na^+ added