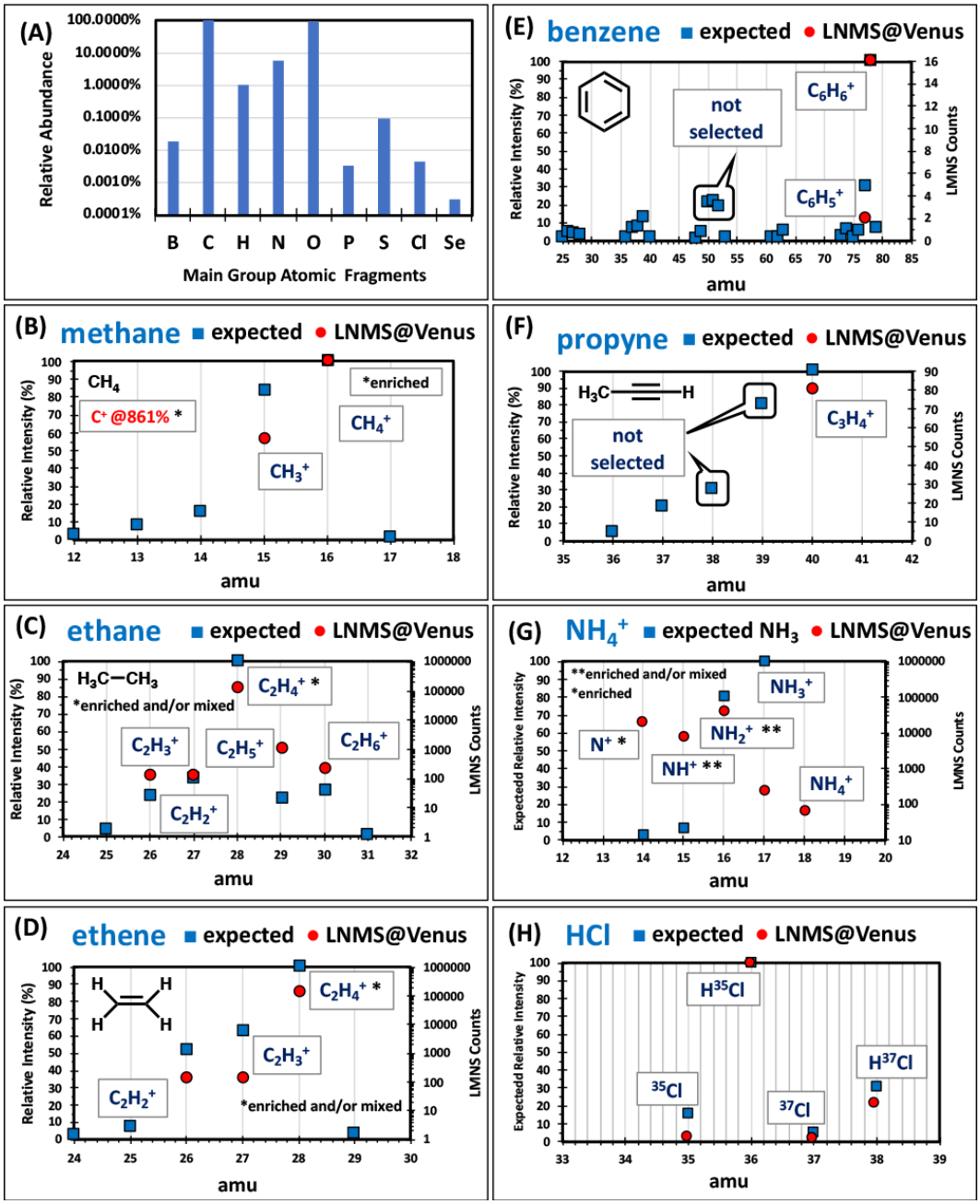

Figure S1. *(A) Relative abundances of daughter main group elements (B, CHNOPS, Cl, and Se) produced by fragmentation in the LMNS; percent abundances are displayed on a log scale, counts are normalized to carbon, and only the most abundant element is displayed. (B-H)* Comparison of fragmentation patterns from the LNMS data (circles, red) to reference spectra obtained from the NIST Chemistry WebBook, MassBank Europe, or published reports (squares, blue); selected chemicals include (B) methane, (C) ethane, (D) ethene, (E) benzene, (F) propyne, (G) ammonium, and (H) hydrochloric acid. Reference spectra are plotted as relative abundances, as are the LNMS data for methane and HCl; however, counts were plotted on the secondary y-axis for ethane, ethene, benzene, propyne, and ammonium, with log-scales used for ethane, ethene, and ammonium. Abundance of off-scale atomic carbon is noted for methane.