Sucrose is by far the industrially most abundant simple carbohydrate with a production volume of more than 160 million metric tons from sugar cane and sugar beet per year. Many promising pathways towards bio-based organic compounds use, however, fructose as the pathway substrate. Hence, a chemocatalytic approach to convert sucrose into fructose would provide a means to channel sucrose into pathways for sugar valorization. Here, we show that a variety of heterogeneous zeolite catalysts with balanced Brønsted and Lewis acidity enable a simple route for the conversion of sucrose to more than 80% fructosides or fructose at 100 °C. The catalysts can encompass aluminum or tin Lewis acidic sites in various zeolite frameworks. The reaction proceeds in volatile alcohol solvents and broadly enables the channelling of sucrose into processes that use fructose as the pathway substrate.