# New Sugar Conversion Mechanisms Identified On Zeolite-based Catalysts

## Scientific Achievement

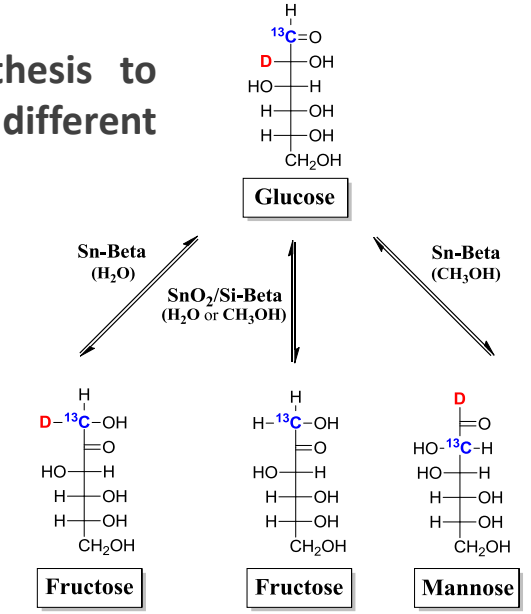
**Lewis acid Sn sites in zeolites selectively catalyze glucose epimerization to mannose in methanol and glucose isomerization to fructose in water. Extraframework $SnO_2$ contains base sites that catalyze isomerization via enolization.**

## Significance and Impact

- **The first demonstration of glucose epimerization via an intramolecular C1-C2 carbon shift (Bilik reaction) on a solid Lewis acid.**
- **Opportunities to tailor catalyst structure during or after synthesis to influence selectivity in biomass and sugar conversion by exploiting different reactions prevalent on different Sn site structures.**

## Research Details

- Framework and extraframework Sn sites identified unambiguously by $^{119}Sn$ MAS NMR.
- Base-catalyzed enolate mechanism for isomerizaton on extraframework $SnO_2$ confirmed by isotopic labeling studies.
- Bilik mechanism for glucose epimerization (intramolecular C1-C2 carbon shift) determined from reactions of isotopically-labeled glucose ($^2H$ at C-2, $^{13}C$ at C-1); product analysis by $^1H$ and $^{13}C$ liquid NMR.

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Work was performed by the group of Mark Davis at the California Institute of Technology