The stereo- and regioselective $\alpha,\alpha-(1\rightarrow1)$-coupling of unprotected sugars is a formidable challenge in organic synthesis. Traditional chemical methods typically lack the desired anomeric control in the formation of a glycosidic bond. Trehalose transferases (TreT) are of particular interest since they catalyse $\alpha,\alpha-(1\rightarrow1)$-coupling of a nucleotide sugar donors and a wide range of sugar acceptors with excellent regio- and enantioselectivity (scheme 1). Interestingly, an inversion of anomeric selectivity was observed when switching from D- to L-monosaccharide acceptors. Also, the semi-preparative chemoenzymatic coupling demonstrated quantitative yields within less than 1 hour of reaction time.

**Scheme 1**: Enzymatic glycosylation with mCherry PyTreT with a nucleotide sugar donor (red) and a sugar acceptor (blue) to an $\alpha,\alpha$- or $\alpha,\beta$-linked non-reducing disaccharide.

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