**Vibrational OPTICAL activity and saccharides**

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The global focus in science is predicted to become increasingly carbohydrates-oriented over the next decade. While the growing impact of carbohydrates on energy, food security and healthcare are already clear, the future development of new carbohydrate-based therapeutics, materials and energy sources will depend heavily on our building a better understanding at the molecular level of the structure-function relationships of carbohydrates. As traditional structural methods are often difficult to apply to carbohydrates, new approaches are urgently required. The main topic of the talk is to present a new spectroscopic-computational approach to study carbohydrate structures and interactions at the molecular level. We have developed widely applicable yet structurally sensitive methodological approach based on chiral variants of vibrational spectroscopies for studying carbohydrates that exploit diverse interactions of carbohydrates with circularly polarized light.1 These spectroscopic techniques are able to reveal previously unknown details on all aspects of complex carbohydrate structure and organization, from the hydration of small sugars to the inter- or intramolecular interactions of macromolecular oligo- or polysaccharides and glycoproteins that govern their physiological functions and use as e.g. healthcare products. In the talk we focus on several examples ranging from structural studies on several simple disaccharides or their derivatives (*C*-disaccharides), AGP glycan antennas to chondroitin (Figure 1; sulfation effects in chondroitin), hyaluronans and their fragments.



**Figure 1.** Sulfation effect on the Raman and ROA spectra of basic disaccharide unit of chondroitin sulfate (lower panels) and N-acetyle-D-galactosamine (GalNAc, upper panels).

[1] Melcrová A.; Kessler J.; Bouř P.; Kaminský J. Simulation of Raman optical activity of multi-component monosaccharide samples Phys. Chem. Chem. Phys., **2016**, *18*, 2130-2142.