Dielectric properties of differently structured $Ti_3C_2T_x$ MXene - nanofibrillated cellulose films

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Abstract

Green renewable biopolymers have attained extensive attention recently in advanced electronics and wearable sensing devices to decrease the cost and, above all, to replace nonbiodegradable dielectric thermoplastic polymers (as e.g. BOPP and PVDF) while retaining device's flexibility and boost their recyclability. Among them, nanocellulose has gained particular attentions due to their inherent biocompatibility, biodegradability, and cost-effectiveness. Nanocellulose consists of linear cellulose chains of repeating ß-D-glucopyranose units, covalently connected through b-1,4 glycosidic bonds, which symmetrical molecular structure with dipole moments of C–H and C–OH bands generate a strong polarity, and yield differently semi-crystalline structures by intra- and intermolecular hydrogen bonds between adjacent glucose groups, all beneficial for a dielectric properties [1, 2].
In this contribution, the impact of additionally present polar carboxylic (−COOH) surface groups and air-absorbed moisture on dielectric properties (dielectric permittivity, dielectric loss and AC Conductivity) of pristine and carboxylated nanofibrilated cellulose (CNF) films will be presented with respect to an increase frequency (from 1 KHz to 1 MHz) and temperature (0 to 100°C). The addition of various weight percentage of multi-layered $Ti_3C_2T_x$ MXene [3] was included in the next stage to assessed its complementary.

References

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