B2 16:15 – 16:30

Crystal Structure vs. Dielectric Property Correlation in the Stoichiometric Sillenites

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Stoichiometric sillenites are compounds with the crystal structure of γ-Bi_2O_3 and the general formula $Bi_{12}MO_{20}$ (e.g. Si^{4+}, Ge^{4+}, $1/2Al^{3+}$ + $1/2P^{5+}$, $4/5V^{5+}$ + 1/5vacancies,...). Nonstoichiometric sillenites are either oxygen deficient or have an excess of oxygen (e.g. $Bi_{12}(Bi^{3+}_{0.5}Ga^{3+}_{0.5})O_{19.5}$). Preliminary experiments showed that sillenites are low-sintering materials (T_s<850°C) with low losses and a modest negative temperature coefficient of resonant frequency (τ_f). All this makes sillenites a potential dielectric material for advanced co-fired integrated modules used in telecommunications technology.

For the fine-tuning of the dielectric properties, which must be performed according to the particular application requirement, an understanding of the relations between crystal-structure features and the properties, such as dielectric constant, dielectric losses and temperature coefficient of permittivity, is essential. In accordance with the theories developed for other structural types, the structure of the oxygen network of the sillenites was again recognized as a key element which controls the dielectric properties. The relevant mechanisms will be presented together with important structural and dielectric data.