Magnetism in MAX and MAB phases

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Since the last progress session on MAX/MAB phases undertaken in CIMTEC 2018, considerable amount of work has been done to explore and understand the magnetic properties in these important nano-laminated materials. Progress was made both in introducing new samples as candidates for interesting magnetic properties and in using additional local probes for studying their magnetism. In CIMTEC 2018, I demonstrated how important it is to use local probes to understand the microscopic magnetic behavior of individual crystallographic sites in the material. It leads to a better understanding of the nature of the magnetic state, and to a unique link between measurement and studied phase, impurities notwithstanding. Here, I will give an overview on the progress made in this field during the last three years, focusing on research led by the NRCN neutron scattering group in collaboration with the Drexel and Linköping groups. I will review how understanding magnetism in MAX phases expanded with the use of the NMR, and μSR methods, and with the introduction (by Linköping) of the REMAX samples, a rich and sophisticated sub-class of MAX phase materials. I will also show, how crucial neutron scattering is for "fine-tuning" the magnetocaloric effect of MAB phase solid solutions provided by Drexel.