Ferrites are finding increasing use at high frequencies due to their higher electrical resistivity and lower magnetic losses as compared to the conventional alloy magnets.

Nickel-zinc ferrite is one of the technically important ferrites. In recent years increasing attention is being paid to nickel-zinc ferrites containing excess iron and a small amount of cobalt. Cobalt ferrite has a positive anisotropy and the presence of a small amount of cobalt ion neutralizes the negative anisotropy of cobalt-free ferrite. Due to the excess $\text{Fe}^{3+}$ ions, cation vacancies are expected to be formed which facilitate the movement of $\text{Co}^{2+}$ ions into certain preferred sites. This leads to a number of changes in magnetic and electrical properties.

The present investigation relates to the synthesis and the study of magnetic, structural and electrical properties of soft ferrites, in particular, Ni-Zn ferrite with excess iron and a small amount of cobalt in which the $\text{Fe}^{3+}$ ions have been partially substituted by other trivalent ions of equal ionic radius such as $\text{Cr}^{3+}$, $\text{Mn}^{3+}$ and $\text{Al}^{3+}$. These substitutions have led to a substantial improvement in the $uQ$ product and the cut-off frequency. The basic
studies on the magnetic, structural and electrical properties of these compounds have been conducted in order to understand the reasons of these improvements.

Before proceeding with the actual experimental results and discussion, we give a general introduction covering the present knowledge about the structure and the magnetic properties of the ferrites.