CONCLUSION

In this thesis we have described in detail a 3Ci $^{241}$Am annular source spectrometer which has been fabricated for the present study. The spectrometer performance is comparable to other standard spectrometers in use elsewhere. The Compton profiles of $T_{12}Ni_{1-x}$ alloys showed non linear variation with composition at low $q$ values, but at higher $q$ values they are linear. This result is qualitatively explained as a charge reorganization within the constituent metals of the alloy.

The $Cr_xNi_{1-x}$ alloys also showed similar behaviour. While the $J(q, x)$ at low $q$ values showed nonlinearity with concentration, at higher $q$ values the variation is linear. The $J(q, x)$ at $q = 0.5 \text{ a.u.}$ showed the same peaking effect at $x=0.5$ as was seen in $T_{12}Ni_{1-x}$. Both $T_{12}Ni_{1-x}$ and $Cr_xNi_{1-x}$ results suggests that the alloying effect is seen more readily at higher concentration than at lower ones.

The chromium based alloys $T_{10.19}Cr_{0.81}$ and $Co_{0.18}Cr_{0.82}$ were studied to look into their electronic structure. The profiles for these alloys are close to the superposition of individual metal profiles. Looking at all the results it is clear that one sees measurable alloying effect in the Compton profiles around the equiatomic concentrations of the partners. However alloys for which the concentration of one of the partners is less than 0.2 the alloying effect is quite small. Most of the effect is seen in the low momentum region because that is the region where the Compton profile is more sensitive to solid state effects.

For the $Fe_xNi_{1-x}$ alloy we did only one measurement for concentration $x \approx 0.5$ and as per the systematics seen for the $T_{12}Ni_{1-x}$ and $Cr_xNi_{1-x}$ alloys we expected the alloy profile to be much different from the superposition profile, but to our surprise we found no alloying effect. The reason for this may be that for the $Fe_xNi_{1-x}$ alloy, the partners are very close to each other in the periodic table.
because of which one does not see any change in the metallic binding when they form an alloy. However, charge transfer effects were seen for this alloy earlier by soft x-ray appearance potential spectroscopy (SXAPS) which could not be confirmed by our present work. This may be possibly because the charge transfer proposed by SXAPS studies take place between 3d states of the two metals for which the Compton profiles are not very much different.

The copper based alloys, namely Cu$_{0.975}$Be$_{0.025}$ and Cu$_{0.63}$Zn$_{0.37}$ also did not show any drastic effects of alloying. Although the Compton Profiles for Cu$_{0.975}$Be$_{0.025}$ alloy and the superposition profile apparently looked the same, their autocorrelation function showed some difference at large distances suggesting that the periodic part of the wave function is changed on alloying. This may be happening because of disorder introduced by alloying with beryllium. The Cu$_{0.63}$Zn$_{0.37}$ alloy also showed not much change between the alloy profile and superposition profile. This means that charge transfer effects are also small for this concentrated alloy.

In summary we would like to say that the present Compton profile studies revealed some interesting alloying effect in some of the alloys where the atomic numbers of the constituent metals differ by more than two units ($\Delta Z > 2$), but for the other alloys where $\Delta Z \leq 2$ the alloying effects are negligibly small. It is also seen that the alloying effect is maximum at the equiatomic concentration. Finally, few remarks on the future prospectus of such studies. We feel that electron structure study of alloys is still an unexplored area and there is good scope for further studies which is expected to produce more interesting results. It is also hoped that the present study will inspire theorists to do the necessary calculations for confirming the present results and the systematics observed. Future studies especially on alloys of transition metals with simple metals and amorphous alloys.
will be of great interest which needs to be explored