A Chemical Abundance Study of 10 Open Clusters Based on WIYN-Hydra Spectroscopy

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We present a detailed chemical abundance study of evolved stars in 10 open clusters based on Hydra multi-object echelle spectra obtained with the WIYN 3.5m telescope. From an analysis of both equivalent widths and spectrum synthesis, abundances have been determined for the elements Fe, Na, O, Mg, Si, Ca, Ti, Ni, Zr, and for two of the 10 clusters, Al and Cr. To our knowledge, this is the first detailed abundance analysis for clusters NGC 1245, NGC 2194, NGC 2355 and NGC 2425. These 10 clusters were selected for analysis because they span a Galactocentric distance range Rgc~9-13 kpc, the approximate location of the transition between the inner and outer disk. Combined with cluster samples from our previous work and those of other studies in the literature, we explore abundance trends as a function of cluster Rgc, age, and [Fe/H]. The [Fe/H] distribution appears to decrease with increasing Rgc to a distance of ~12 kpc, and then flattens to a roughly constant value in the outer disk. Cluster average element [X/Fe] ratios appear to be independent of Rgc, although the picture for [O/Fe] is more more complicated by a clear trend of [O/Fe] with [Fe/H] and sample incompleteness. Other than oxygen, no other element [X/Fe] exhibits a clear trend with [Fe/H]; likewise, there does not appear to be any strong correlation between abundance and cluster age. We divided clusters into different age bins to explore temporal variations in the radial element distributions. The radial metallicity gradient appears to have flattened slightly as a function of time, as found by other studies. There is also indication that the transition from the inner disk to the outer disk occurs at different Galactocentric radii for different age bins. (Abridged.)

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