Calibrating oxygen abundances from emission-line ratios using a large sample of SDSS-DR4 star-forming galaxies

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We use a large sample star-forming galaxies from SDSS-DR4 $\sim$100,000) to derive oxygen abundance calibrations of galaxies on the basis of the equivalent width (EW) ratios of four metallicity-sensitive emission-line ratios, including [N II]/Hα, ([O II]/Hβ)/([N II]/Hα), [N II]/[S II], and [O III]/Hβ. The analytic calibrations of 12+log(O/H) versus these line-ratios, and the rms derivations have been obtained. These observed relations have been compared with photoionization models. **The Luminous Infrared Galaxies detected by IRAS show relatively metal-rich.** Oxygen is the most commonly used metallicity indicator in the ISM of galaxies. To determine metallicities of galaxies, when the direct electron temperature (T_e) method, and the empirical R_{23} method (the flux ratios of emission lines ([O II]+[O III]) to Hβ) are not available, the flux ratios of some other metallicity-sensitive emission-line ratios can be used, such as [N II]/Hα, ([O III]/Hβ)/([N II]/Hα), [N II]/[S II], and [O III]/Hβ (Kewley & Dopita 2002; Liang et al. 2006a and references therein). These ratios can also break the "double-valued" property of R_{23} for the higher/lower metallicities. **However, in the current generation of wide-field galaxy surveys on multiobject spectrographs, flux calibrations is frequently problematic, because of unfavorable observing conditions or instrumental effects such as a variation in system response over the field of view. One has to try to use the EW values of the related emission lines to estimate their metallicities.** Kobulnicky & Phillips (1998) and Liang et al. (2006b) have checked the possibility of using EW(R_{23}), but where the key point is whether the spectral continua underlying [O II] and Hβ (as well [O III]) are almost the same or not. That is because the flux (F_λ) and EW (W_λ) values of the emission-line have a continuum scale-factor: $W_\lambda = \frac{F_\lambda}{F_{C\lambda}}$, which limits the use of the EW(R_{23}) method. Therefore, here we use the EW ratios of [N II]/Hα, ([O III]/Hβ)/([N II]/Hα), [N II]/[S II], and [O III]/Hβ of a large sample of SDSS-DR4 star-forming galaxies to derive oxygen abundance calibrations, which skip the effects of underlying continua by taking advantage of their close positions in wavelength of the two related lines. These calibrations can be used as references for the future studies about metallicities of galaxies, specially when the spectra cannot be flux calibrated properly.