Discharge-pumped UV and visible lasers

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Laser actions of six excimer systems, XeF, XeCl, XeBr, KrF, KrCl, ArF and four other systems N_2, N_2^+, F, Ne were obtained by using varied lasing gases in a UV preionized discharge device. The wavelengths cover from the UV to visible range of spectra with nearly 300 lines.

In the XeCl laser, the maximum energy per pulse was over 400 mj with Ne as diluent in a HCl/Xe/Ne mixture at a total pressure of 3 atm. The specific output pulse energy and the laser efficiency were 6j/liter and 5%, respectively. Among them, the stimulated emission was observed from the XeBr laser for the first time with BBr_3 as the bromide donor in a He: Xe: BBr_3 mixture at a total pressure of 600 torr.

Using the spectrum of second and third order a 2-meter graitng spectrometer, high resolution spectra of the XeF, XeCl lasers were studied. We found that the observed spectra varied with the coupling efficiency of the output mirror and the total pressure. For example, with a total pressure of 500 torr, 108 laser lines in 12 groups were observed for the first time in XeCl laser. However, when the total pressure is 2 atms. only a few lines were observed.

In the N_2^+ laser, 4278 Å line was found in doublet at the $B^2\Sigma_n^- - X^2\Sigma_g^+$ transition of the first negative band.

Experimental apparatus and some other experimental results are also presented in this letter.

放电泵浦的紫外和可见激光器

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在一台紫外预电离放电装置上，采取更换激射气体的方法，获得了六个准分子体系：XeF、XeCl、XeBr、KrF、KrCl、ArF和其他四个激光体系：N_2、N_2^+、F、Ne的激光作用。辐射波长从紫外到可见区接近300条激光线。

在XeCl激光器中，以Ne作稀释气体，在HCl/Xe/Ne混合物中，总气压三个大气压，最大输出能量超过400mj，电效率超过5%，体能密度为6j/l。

XeBr激光器，我们首次采用BBr_3作含溴化合物，在BBr_3: Xe: He混合物中，总气压600托获得激光输出。

以二米光栅光谱仪的二级谱和三级谱首次详细研究了XeF、XeCl的高分辨率光谱，发现辐射谱线的数目取决于总气压及输出腔镜的耦合率。在XeCl激光器，当总气压为500托时，观察108条激光线，分属12个振动带的跃迁。当气压为二个大气压时，只有几条激光线。

在N_2^+激光器中，观察到第一负带$B^2\Sigma_n^- - X^2\Sigma_g^+$跃迁的4278Å(0,1)由双线组成。

最后还讨论了上述激光器的可能应用。