

## Anastigmat lenses for UV

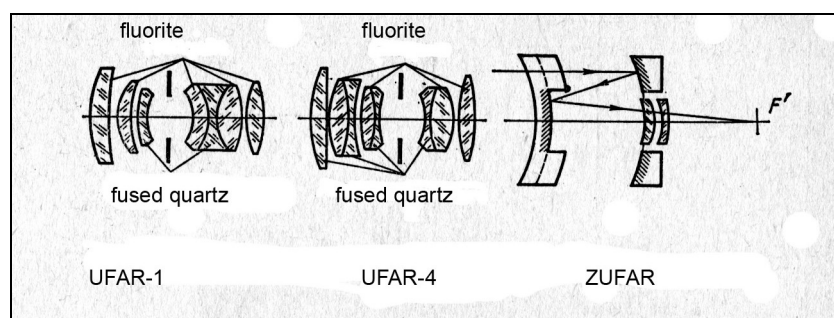
UV aplanat-lenses exist already for a long time. It is difficult to design anastigmat lenses for UV because of all useful optical materials (quartz, fluorite and others) have low refractive indexes, that creates difficulties for field curvature correction of the image plane of large aperture anastigmats. There are common anastigmat lenses (for example Tessar-type) made from increased transmission ratio glasses for long-wave ultraviolet. But these lenses had not large relative aperture (1:6,3 -1:4,5) and used for wavelengths >340-350 nm.

For works in 260-250 nm wavelengths new triplets were made. Positive lenses of these triplets were made of quartz, negative lenses - mine salt. Because of the big hygroscopic property of mine salt, it was preserved within quartz plates. When they got synthetic fluorite that had large size and good transmissivity (up to 250 nm), they could use that for positive lenses ( $N_d=1,43385$ ;  $\nu=95,1$ ) in combination with fused quartz ( $N_d=1,45860$ ;  $\nu=68,0$ ) that was used like flint glass.

For last years D.Volosov, N.Melnikova and T.Shamanina designed high-aperture lens anastigmats UFAR and long-focus mirror-lenses ZUFAR for wavelengths from 230 to 410 nm. These lenses may be used for 24×36mm film cameras. UFAR lenses have a transmission ratio of more than 50% in spectral zone of 250 nm. So they can be used in more shortwave range, up to near 230 nm.

**Anastigmat lenses for UV (230-410 nm)**

Lens name	Focal length, mm	relative aperture	Pickup angle, $2\omega$ , degrees	Lens groups/elements numbers	Photographic Resolution, 1/mm		Lens material
					In centre	At edge	
UFAR-4	52,4	1:2,8	45	5/8	85	15	Fluorite, fused quartz
UFAR-1	100	1:4	24	5/7	63	15	
ZUFAR-2	350	1:4	6	Mirror-lens	57	47	
ZUFAR-1	500	1:4	4	Mirror-lens	50	44	



Resolution power of the lenses considerably decreases from the centers to the edges of the image because of impossible full correction of field curvature due to the small index differences of the refraction of the used glasses (i.e. quartz vs. fluorite).

These lenses are interesting for criminalistic work, spark discharge photographing and other applications.

ZUFAR lenses are apochromatic lenses for a wide spectral range (from 230 to 700 nm) and can be used to photograph distant objects without any filters, for example the Moon surface and planets without atmosphere.