

Characteristics of NO Oxidation by 172 nm VUV Irradiation

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NO_x emission control from ship exhausts had launched in 2016 by International Maritime Organization (IMO). Selective catalytic reduction (SCR), an efficient treatment technology, has been used world-wide for NO_x removal. However, a drawback of SCR systems in application to ship diesel engines is that they are particularly costly and the use of chemical agent such as urea or ammonia. Photochemical NO removal without reduction agent by vacuum ultraviolet irradiation (VUV) of a 172 nm wavelength is a promising technique. In this work, characteristics of NO oxidation by VUV were investigated in detail. The photochemical reactor was 1000 mm in the length and 43 mm in the inner diameter as shown in Fig. 1. The excimer lamp was 847 mm in the length and 20 mm in the outer diameter. Fig. 2 shows variation in NO_x removal with an increase in initial NO concentration. The flow rate of the simulation gas (NO-H₂O-O₂), F , was varied at the ranges from 10 L/min to 20 L/min. About 90% NO_x removal was obtained at NO_{IN} = 500 ppm and F = 20 L/min. At the flow rate of 20 L/min, NO_x removal was gradually decreased above NO_{IN} = 500 ppm. The maximum NO_x removal at 90% NO_x removal in the large-scale photochemical reactor was 0.72 g-NO/h.

Index Terms — NO_x removal, Vacuum ultraviolet, Selective non-catalytic reduction

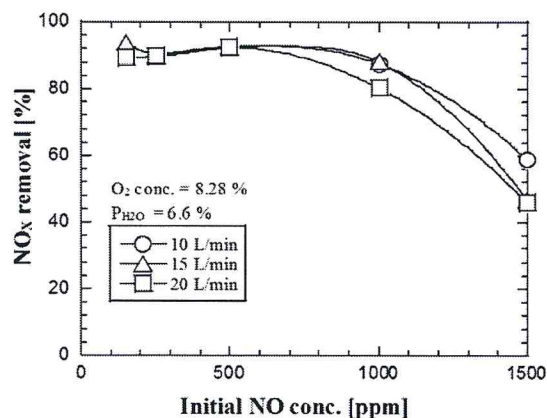
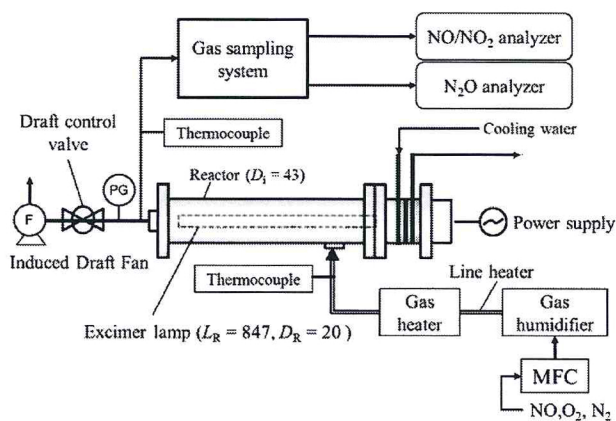


Fig. 1 Experimental setup for NO removal by VUV.

Fig. 2 Characteristics of NO_x removal by VUV.