INTRODUCTION
Black carbon (BC) is formed by the incomplete combustion of hydrocarbon fuels and intensively absorbs light of all wavelengths of solar radiation. BC is emitted with other particles and gases such as SO₂, NOx, and organic carbon (OC). These other gases and particles than BC sometimes create uncertainty associated with measurement techniques which are affected by the presence of the others in the present study, to remove the effect of the other particles and gases than BC, we have initiated the investigation of the nearly ‘pure’ BC. The optical properties such as the absorption cross section as well as the physical properties such as the effective density will be estimated to characterize the pure BC. Then we compare the BC with the elemental carbon (EC) to quantify the relation between the BC and the EC.

METHOD
Particle Generation
A spark discharger (PALAS GmbH, DNP 2000) generates black carbon (BC) by continuous sparks created by high voltage. The generated particle is called as ‘PALAS carbon’, which is known to similar to diesel soot.

Size Distribution Measurement
The size distributions of the spark-generated soot were measured by the differential mobility analyzer (DMA, home-designed) equipped with a condensation particle counter (CPC, TSI 3775). The aerosol was dried using a diffusion drier before the aerosol is introduced into DMA & CPC.

Elemental Carbon Measurement
Elemental carbon concentrations are measured by an EC/OC Analyzer (Sunset, USA), which uses a thermal-optical method. In an oxygen-free helium atmosphere, PALAS carbon collected onto quartz filter is heated to remove all OC from the sample. As the organo-compounds are vaporized, they are immediately oxidized to CO₂. After the PALAS carbon on the filter is cooled to a relevant temperature, a 2% O₂/He mixture is injected into the sample oven. The sample oven temperature is then increased up to a given temperature, during which the EC is oxidized to CO₂ due to the presence of oxygen. This CO₂ is then converted to CH₄, and detected by the Flame Ionization Detection (FID) for the quantification of the EC.

RESULTS & DISCUSSION
Size Distribution of PALAS soot
The effective density of PALAS carbon decreases as the particle size increases. This implies that the morphology of the PALAS carbon changes from a compact aggregate to a loose aggregate. The effective density of nigosin and black dyed polystyrene latex (BPSL) is higher than the PALAS carbon aggregate because nigosin and BPSL are spherical, that is, of no void. The result of diesel soot lies between those of PALAS carbon and nigosin.

BC/EC Comparison (PALAS carbon)
As shown below, the correlation coefficient between the BC and the EC for PALAS carbons ranged from 0.60 to 0.71, which is higher than the values of 0.15 and 0.26 obtained by Saathoff et al. (2003).

BC/EC Comparison (Ambient)
As shown right, the correlation coefficient between the BC and the EC is 1.46, which is more similar to the present result than the previous study. This result implies that PALAS carbon can be a proxy for ambient aerosol.

CONCLUSIONS
• BC and EC concentrations were compared for the PALAS carbon particles generated in a spark-discharger.
• Effective density for PALAS carbon was determined using BC mass concentration, number concentration and mobility equivalent diameter.
• BC/EC correlation coefficient for the size-selected PALAS carbon was 1.15, which showed similar trend to the value for ambient aerosol but higher than the values measured in a previous study.

ACKNOWLEDGMENT
This work was supported by the Korea Ministry of Environment as Converging Technology Project (2013001650004). The author gives special thanks to Mr. S. Han for collecting data.

REFERENCES