

A study of triboelectric charge behavior through the cryogenic measurement

Da Woon Jin¹, Huidrom Hemojit Singh¹ and Jong Hoon Jung*

Department of Physics, Inha University, Incheon 222 12, Republic of Korea

e-mail : merhaven@naver.com (D.W.J), jhjung@inha.ac.kr (J.H.J)

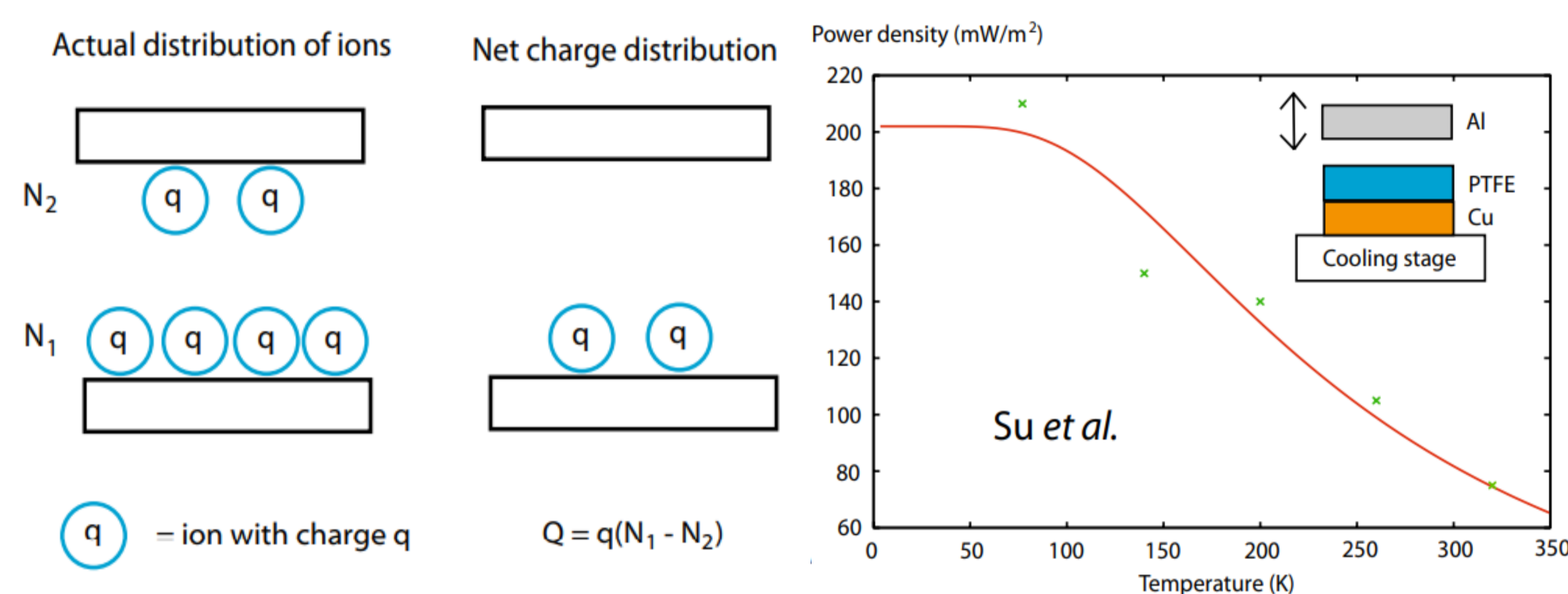


Introduction

- Temperature dependence of the triboelectric charge behavior is one of the critical tools for investigating the origin of triboelectric charges.

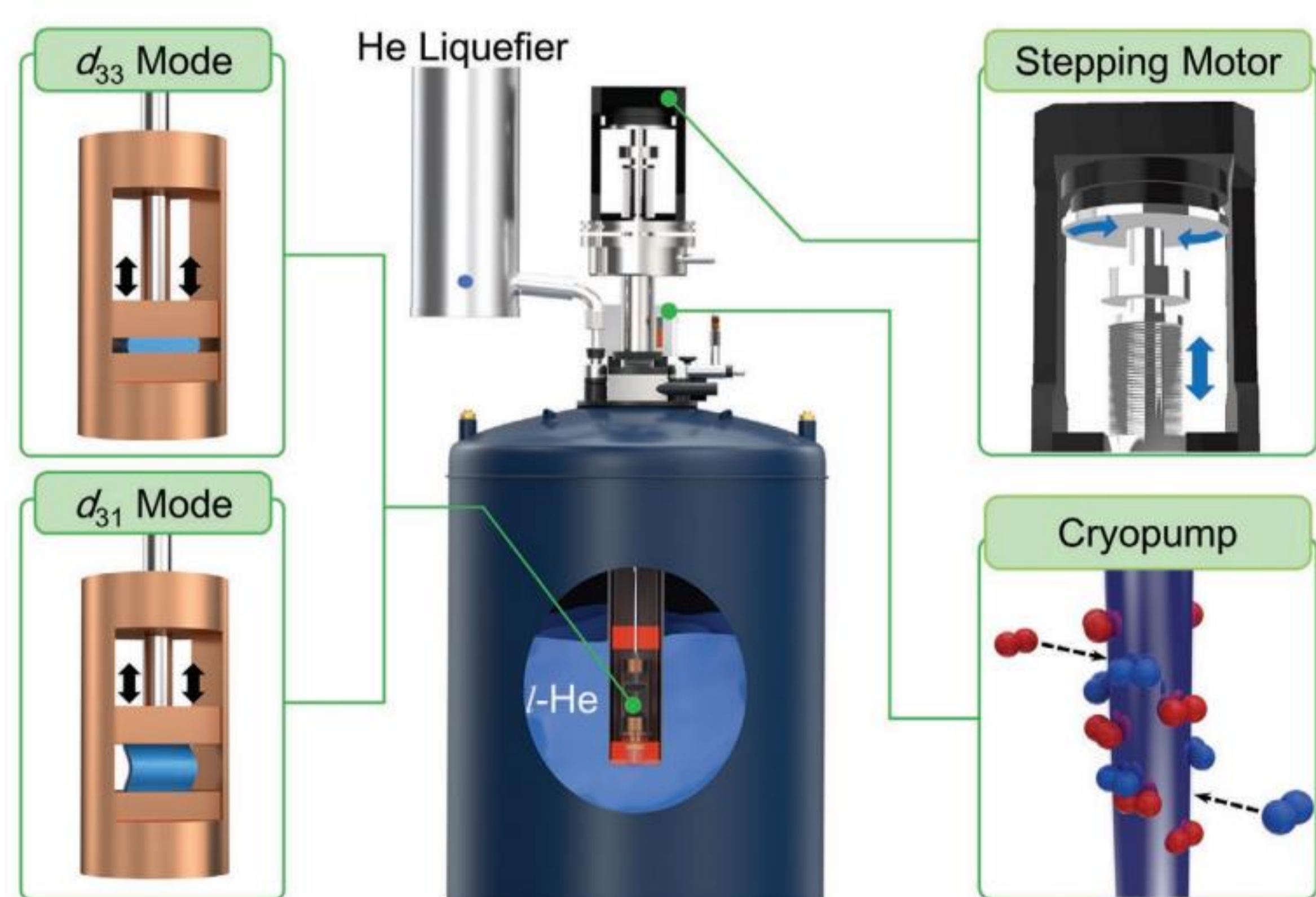
- M. Olsen *et al.* have proposed the two-level Schottky model to explain the temperature dependence of the triboelectric charge behavior, and this model explains the PTFE-Al system very well.

- To make this phenomenon more generally, further studies on various materials are required.



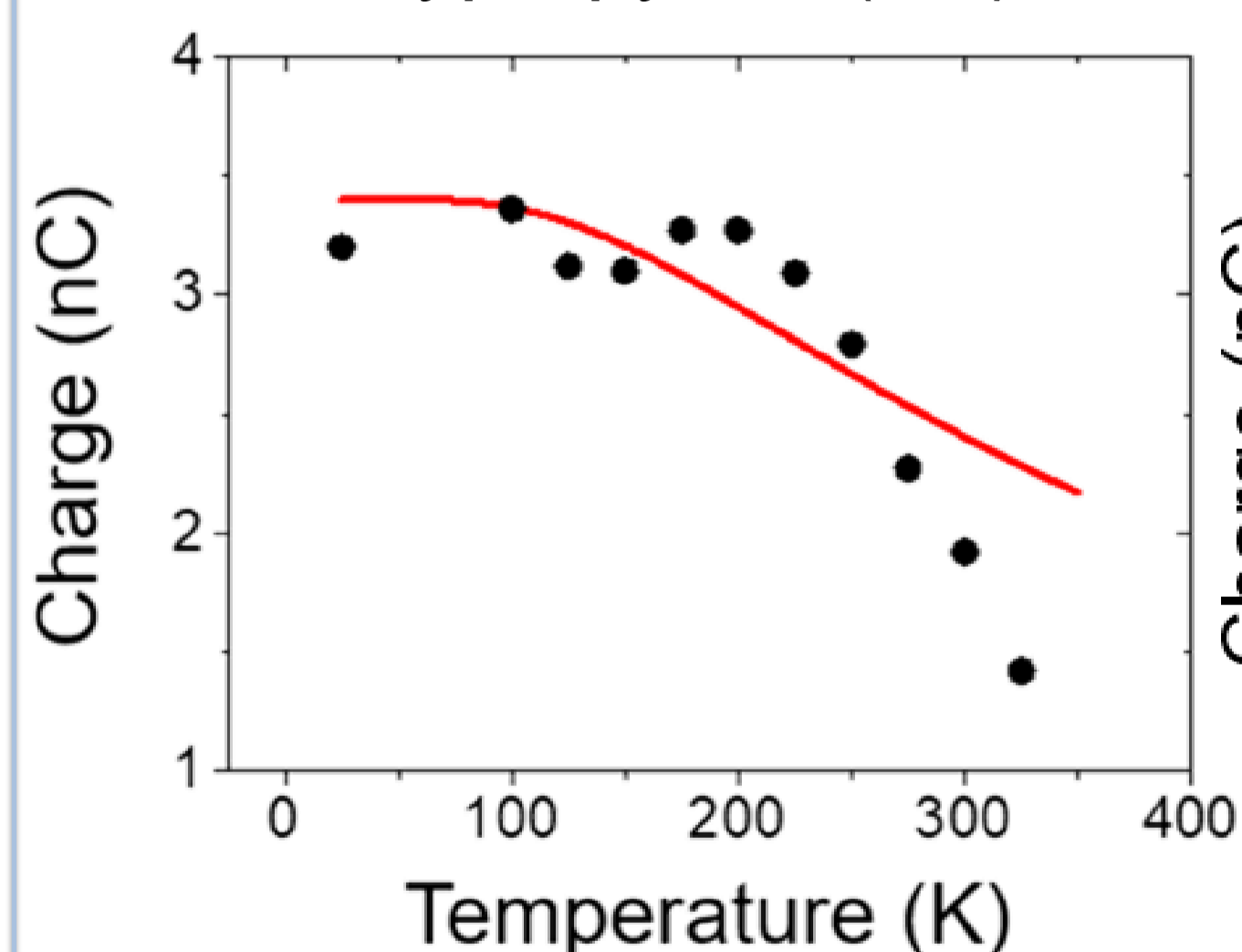
M. Olsen et al., *scientific reports* (2018), **8**, 5293

Results & Discussion



Triboelectric measurement system at cryogenic temperature equipped in a Physical Property Measurement System (PPMS)

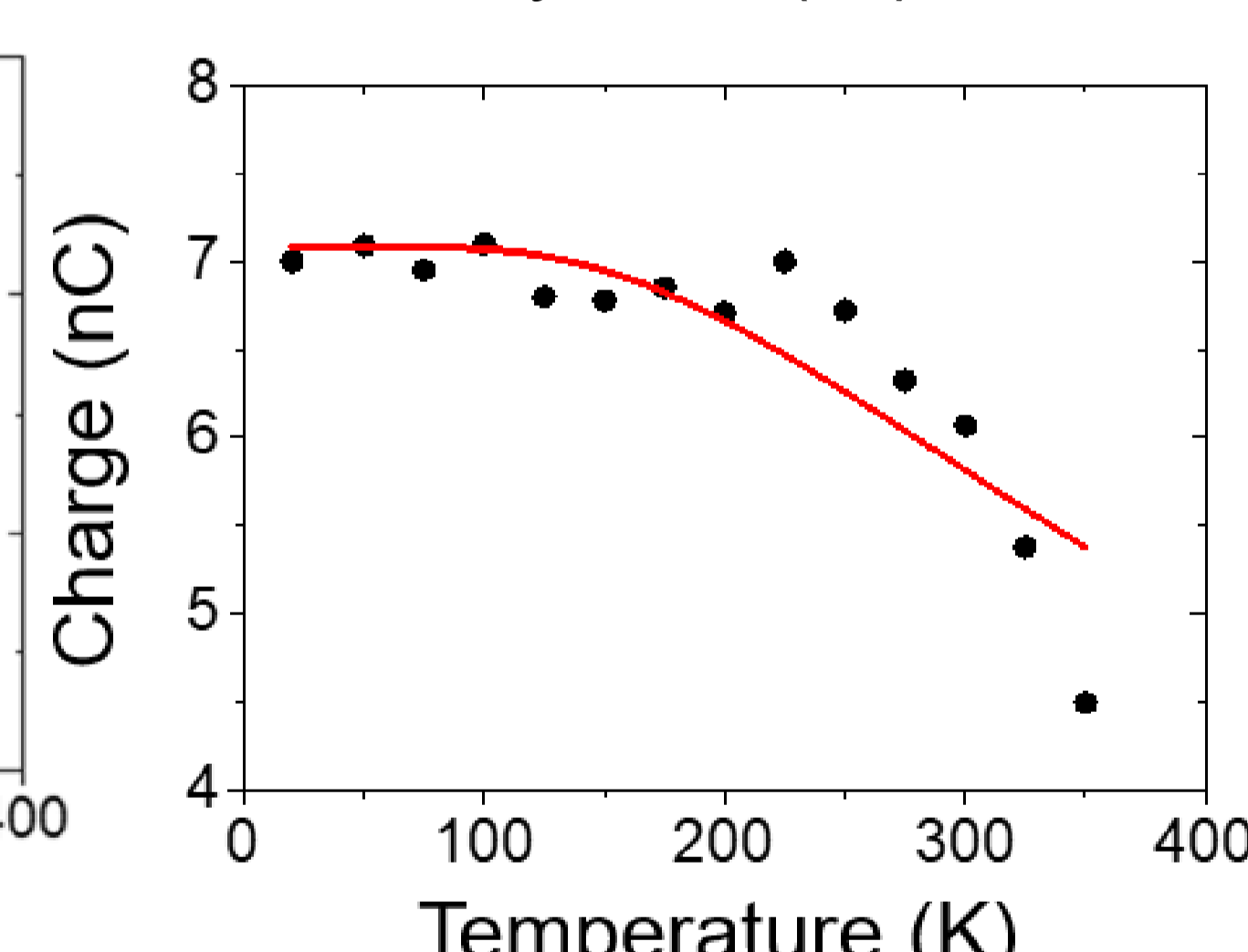
Polypropylene(PP)/Al



$$q = 3.4 \text{ nC}$$

$$E/k_B = 470 \text{ K}$$

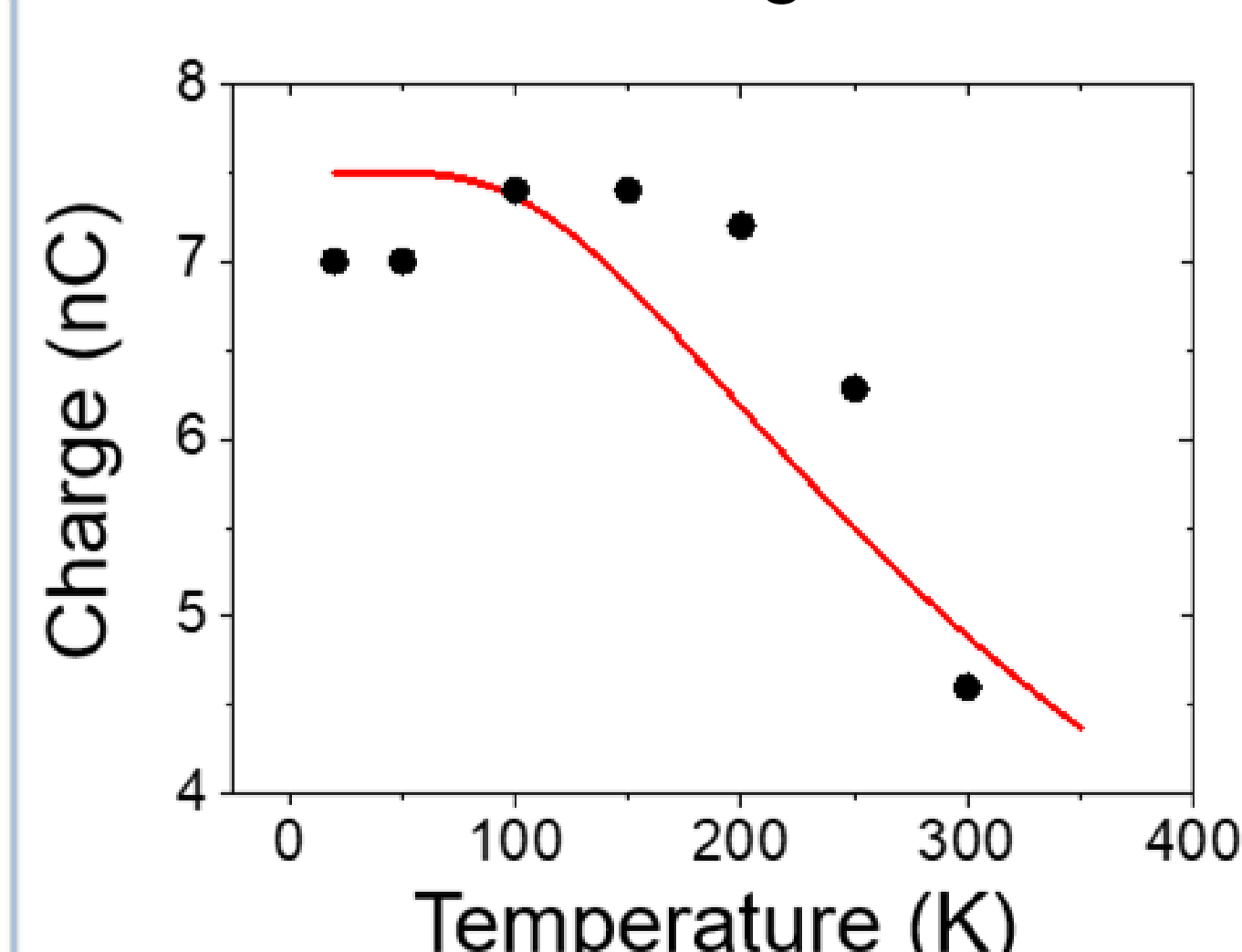
Polyimide(PI)/Al



$$q = 7.1 \text{ nC}$$

$$E/k_B = 696 \text{ K}$$

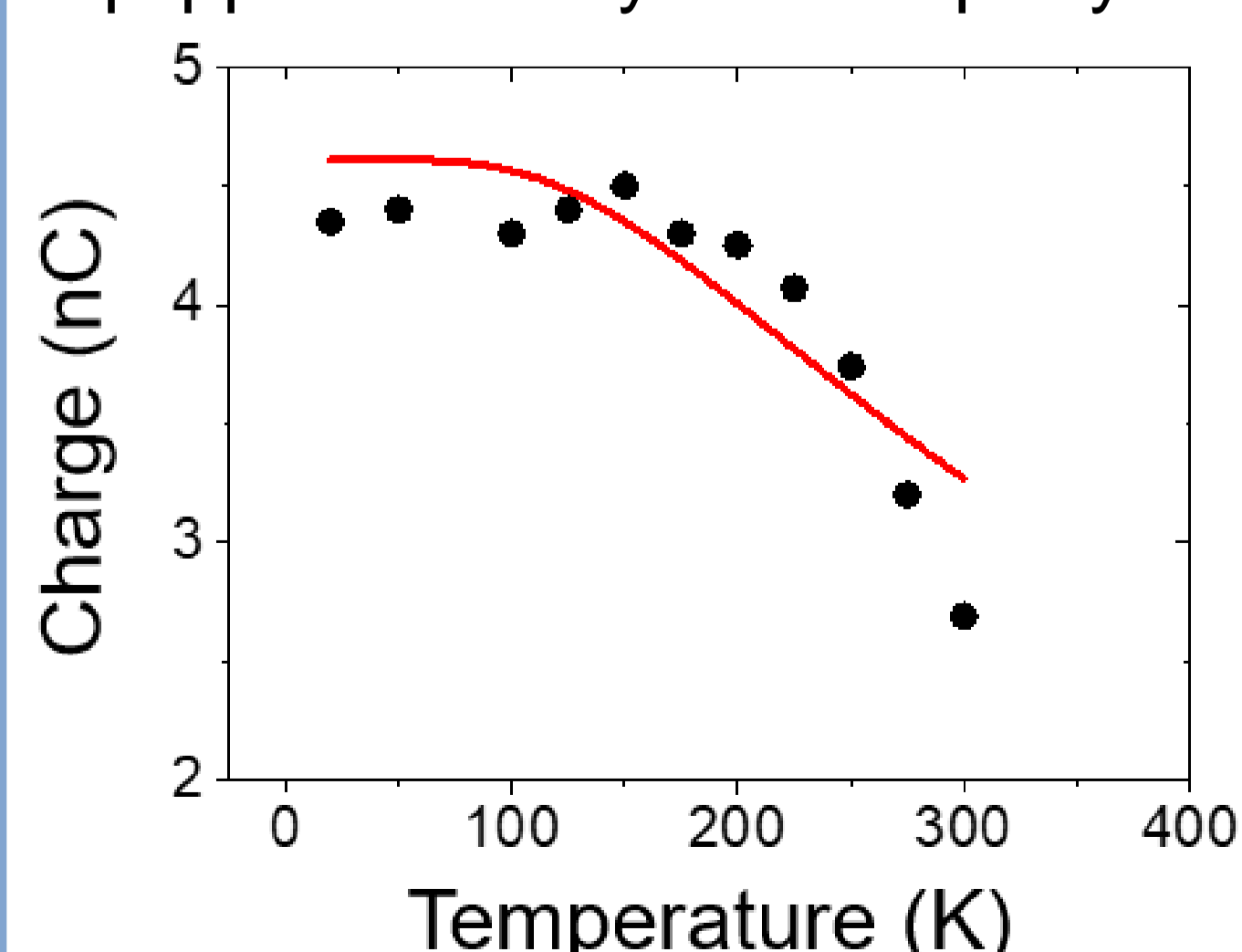
Corona discharged PTFE/Al



$$q = 7.5 \text{ nC}$$

$$E/k_B = 467 \text{ K}$$

→ q is increased by corona discharged



$$Q = qN \left(\frac{2}{1 + e^{-E/k_B T}} - 1 \right)$$

$$q = 4.6 \text{ nC}$$

$$E/k_B = 530 \text{ K}$$

Temperature dependent triboelectric charge of a PTFE/Al