

# Abstract

## Collection Efficiency and Manikin-based Total Inward Leakage Study of Filtering Facepiece Respirator Challenged with Silver Nanoparticles

Jong-Kyu Kim, Ji-Won Ro

*Work Environment Research Department Occupational Safety and Health Research Institute, KOSHA*

### 1. Objectives

The production and use of nanomaterials has been increased. In 2014 Workplace Survey Results, 335 companies produce and treat nanomaterials has been identified. However, lack of data on nano-toxicity and a method for risk management and regulation on nano particles and the standard test method are not sufficient. Protective equipment selection guidelines for nanomaterials are not established. It is required to carry out respirator efficiency test against nanoparticles.

This study was performed to evaluate Collection Efficiency and Manikin-based Total Inward Leakage of Filtering Facepiece Respirator Challenged with SilverNanoparticles.

## 2. Methods

We investigated Collection Efficiency and Total Inward Leakage of 7 respirator with Silver nanoparticle.

## 3. Results

The geometric mean diameters of Silver nanoparticles were 30 nm and number concentration were 106 #/cm<sup>3</sup>.

Collection efficiency of six of the seven Filtering Facepiece Respirator was more than 98% and one 1 Filtering Facepiece Respirator collection efficiency was 94.9%. Artificial breathing machine based Total Inward Leakage were 7.6% ~ 42.3%. Manikin-based Total Inward Leakage were 11.2% ~ 32.9%. We can not find the difference of Total Inward Leakage between breathing patterns.

## 4. Conclusion

The results of this study nano-silver filter efficiency is high but the total inward leakage is higher than filter penetration. Therefore, education on How to Wear a respirator should be demanded. Especially for workers handling nanomaterials and toxic material, User seal checking and fit test must be performed.

**Keywords:** Respirator, Silver nanoparticles, Collection Efficiency, Total Inward Leakage, Fit test, Artificial Breathing machine, Manikin-based